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AND DRAINAGE
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Reforming water resources policy

A guide to methods, processes and practices

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Canada
NRA WATER RESOURCES STRATEGY
NRA
NATIONAL WATER POLICY
GOVERNMENT OF INDIA MINISTRY OF WATER RESOURCES NEW DELHI SEPTEMBER, 1987
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integrated development and management river basins
the french approach
Water Policies And Strategies

Food
and
Agriculture
Organization
of
the
United
Nations

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Foreword

The 25th Session of the FAO Conference agreed that the policy advisory role of FAO, especially at the country level, was extremely important and likely to expand. In particular, the Conference expressed the view that FAO should focus on sector and subsector reviews, and sector and structural adjustment work at the level of the countries concerned. The recommendations from *Agenda for Development* by the UN Secretary-General in 1994 (UN-GA, 1994) stated that development should be driven by national policies dedicated to improving the well-being of the country and its people. While each country is specific and so differs from others, the general concept is that water-sector policy is a priority requirement and that the **approach** and the **process** of policy review and policy management can be developed.

This Guide responds to the above mandate. FAO is concerned with the efficient and sustainable management and use of water resources for food production and rural development. The increasing scarcity of water and growing environmental concerns over the decline in water resources are forcing water policy-makers to enlarge the focus of their work. It is now necessary to view the sector as a whole, acknowledge the claims of all water users, assess and plan the resource in an integrated fashion, and consider changes in policies and institutions as well as projects.

This Guide has a number of purposes:

- to indicate the wide range, and ramifications, of water management, and the relationship between the 'water sector' and other parts of the economy;
- to identify the principal issues involved in managing water resources, for the guidance of policy-makers;
- to set out principles and criteria by which water resources can be managed;
- to introduce some of the methods and processes entailed in a water policy review;
- to illustrate how different countries have carried out such reviews, and how they have gone about implementing their findings; and, by means of the above,
- to promote national policy and legislative reform, planning, and institutional development in the water sector.

It is intended to be of benefit to all those likely to be involved in national water policy reviews. This includes ministers, their advisers, senior administrators and managers, and specialists and professionals. It should be read by those active in the water sector in its widest sense, not just those in directly water-related undertakings.

A first draft was prepared internally by the Water Resources, Development and Management Service, the Policy Analysis Division and the Development Law Service, based on internal

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research and specially commissioned legal case studies, which have been published separately (FAO, 1993b). That draft drew upon the experience of FAO-assisted water policy reviews in various countries, and also upon material contained in the State of Food and Agriculture 1993 Report focusing on *Water Policies and Agriculture*.

The final version of the Guide was prepared by Mr James Winpenny of the Overseas Development Institute, London. It incorporates original material on policy analysis by Mr B.G. Appelgren, legal aspects by Mr S. Burchi, and economic analysis by Mr R. Stringer. It also benefits from comments and material supplied in the *Expert Consultation on Methodology for Water Policy Review and Reform*, held in FAO, Rome, 1995.

Non-specialists, or specialists interested in a wider appreciation of the subject, would find Chapters 1, 2 and 3 relevant, as well as the later chapters. Readers with a good grounding in the subject and looking for guidance on how to carry out a water policy review might wish to turn to Chapters 4, 5 and 6.

Chapter 5 would take the reader quickly to the heart of the process of water policy reviews, and contains the essence of the approach recommended in this Guide.

The Bibliography can be used as a selective guide to some of the more relevant recent literature on this subject.

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Glossary of technical terms and abbreviations used

Aquifer	A water-bearing stratum of permeable rock or soil able to hold or transmit much water.
Assessment (water resources)	An examination of the aspects of the supply and demand for water and of the factors affecting the management of water resources.
CBA	cost-benefit analysis
CEA	cost-effectiveness analysis
Comprehensive water resources management	Water resources planning, development and control that incorporates physical, social, economic and environmental interdependencies.
Cost recovery	Fee structures that cover the cost of providing the service or investment.
De-centralization	The distribution of responsibilities for decision making and operations to lower levels of government, community organizations, the private sector, and non-governmental organizations (NGOs).
Demand management	The use of price, quantitative restrictions, and other devices to limit the demand for water.
Dublin Statement	The Dublin Statement on Water and Sustainable Development, adopted at the International Conference on Water and the Environment (ICWE).
EC-HELCOM	European Commission-Helsinki Commission, which in 1992 agreed the Revised Convention on the Protection of the Marine Environment of the Baltic Sea Area, setting, *i.a.*, standards for effluent water quality.
Ecosystem	A complex system formed by the interaction of a community of organisms with its environment.
EIA	environmental impact assessment
FAO	Food and Agriculture Organization of the United Nations
GDP	gross domestic product
GNP	gross national product
IAP-WASAD	International Action Programme on Water and Sustainable Agricultural Development
ICWE	International Conference on Water and the Environment, attended by over 500 participants from over 100 countries and over 80 international governmental organizations and NGOs, and held in Dublin, Ireland, 26-31 January 1992.
Institutions	Organizational arrangements and the legal and regulatory framework – the 'enabling environment' – in which organizations operate.

Market failure	A divergence between the market outcome, without intervention, and the economically efficient solution.
NGO	non-governmental organization
O&M	operation and maintenance
Policy	A declared intention and course of action adopted by government, party, etc., for the achievement of a goal.
Programme	A definite plan of intended procedure.
Project	A scheme or undertaking.
Opportunity cost	The value of goods or services foregone, including environmental goods and services, when a scarce resource is used for one purpose instead of for its next best alternative use.
Ramsar Convention	Convention on Wetlands of International Importance especially as Waterfowl Habitat, done at Ramsar on 2 February 1971 and signed by 22 European States. It came into force on 21 December 1975.
R&D	research and development
River basin	A geographical area determined by the watershed limits of a water system, including surface and underground water, flowing into a common terminus.
Sewage	Liquid refuse or waste matter carried off by sewers.
Sewerage	The removal and disposal of sewage and surface water by sewer systems.
Stakeholder	Organization or individual that is concerned with or has an interest in water resources and that would be affected by decisions about water resources management.
Strategy	A set of chosen short-, medium- and long-term actions made to implement water-related policies.
UFW	un-accounted-for water, i.e., the volume of water lost through leakage or irregular practices between entering a distribution system and reaching the users.
UN	United Nations
UNCED	United Nations Conference on Environment and Development (Rio de Janeiro, Brazil, 1992). Also known as The Earth Summit.
Wetlands	Areas of marsh, fen, peatland, or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water less than six metres deep at low tide.

Chapter 1

Introduction

The chapter begins by noting some of the special characteristics of water – physical, social and economic – which make it special, and which make a high degree of government involvement in the sector inevitable. Special emphasis is placed on the size and scope of the sector, making the point (for a mainly agricultural readership) that water involves many other sectors, and its use has wide repercussions. Since some of the results of water use transcend international boundaries, the chapter includes an account of recent international events, notably the Dublin Conference and the Rio UNCED, at which governments accepted the need to review policies in the water sector, recognizing in particular its growing scarcity value.

The purpose of the Guide is described as identifying the issues involved in water management, setting out principles and criteria for such management, introducing some useful methods and key processes, and indicating some of the results obtained in actual cases. The target reader is defined widely as anyone likely to be involved in water policy reviews, from ministers to technical specialists. It is also intended for those specialists working in the water sector who wish to satisfy their interests in the wider issues addressed, and particularly the general philosophy underlying the Guide.

SPECIAL ATTRIBUTES OF WATER

It is commonly accepted that access to water is a basic human right. The Dublin Conference (International Conference on Water and the Environment [ICWE]) in 1992 asserted that

> "...it is vital to recognize first the basic right of all human beings to have access to clean water and sanitation at an affordable price."

The connection between water and human life is most dramatic in arid regions, where crop irrigation is essential to food production.

Many societies believe that water has special cultural, religious and social values, which marks it out from other economic goods. In many cultures, goals other than economic efficiency influence the choice of water management institutions. Some religions even prohibit water allocation by market forces.

However, the focus on water's special status tends to obscure the fact that, in most societies, only a tiny fraction of water consumption is actually for drinking and preserving life. A large portion of urban water is used for convenience and comfort. In the arid western USA, per caput water withdrawal by households frequently exceeds 400 litres per day, about half of which is used to irrigate lawns and gardens. Most of the remainder is for flushing toilets, bathing, and washing cars.

The value of water to particular users depends crucially on its location, quality and timing. Its location determines its accessibility and cost. Its quality affects whether it can be used at all, and at what treatment cost. The time when it is available governs its reliability and its relative value for power, irrigation, environmental or potable uses.

In addition, the value of water, especially in agriculture, is inseparable from the type of land to which it is applied, the nature of the soil, its drainage possibilities, etc. Saline water is, for instance, unusable on some soils, but viable on others.

Water has two features that further complicate management efforts: bulkiness and mobility. The value per unit weight tends to be low. Transporting and storing water is costly relative to its economic value at the point of use. In crop irrigation, the water applied may yield additional economic values of less than $US 0.04 per tonne of water.

Water is also difficult to identify and measure because it is a fugitive resource – it flows, evaporates, seeps and transpires. This evasive nature means that exclusive property rights, which are the basis of a market economy, are hard to establish and enforce.

Water projects that attempt to compensate for extreme seasonal variations such as floods and droughts frequently require enormous investments. The economies of scale are such that a single supplying entity is often the most economically efficient organizational arrangement. This is a classic 'natural monopoly'. At the other extreme, most economies of size for pumping groundwater are achieved at relatively small outputs and multiple suppliers can therefore operate efficiently.

Aquifer management is often complicated by the aggregate impact of the actions of many individuals. Even though each individual may have a negligible impact when taken alone, the sum total can be of major importance. One tube-well has little effect on the total water supply, but thousands of tube-wells can quickly deplete an aquifer. Establishing effective policies to regulate water abstraction by these many small, scattered decision-makers is exceedingly difficult.

THE CASE FOR PUBLIC INTERVENTION

The above characteristics of water make a large measure of public intervention inevitable. Economies of scale in the collection and distribution of water tend towards natural monopolies, which need to be regulated to serve the public interest. The fact that many investments are huge, and have a long time-horizon, often discourages private capital, and requires large amounts of public investment.

Water uses in a river basin or aquifer are inter-dependent, which is to say that users impose 'externalities' on others that they ignore in their own decisions (e.g., discharging polluting effluent into a river causes harm, inconvenience and costs to other river users). In some respects, water is a 'public good' in the sense that it is impractical to exclude users or beneficiaries, and therefore impossible to apply charges for such ill-measurable benefits as improved navigation, flood control, or reduced river pollution. Where this is the case, private investment will not be forthcoming. In both these respects, water is prone to 'market failure', which implies that some public involvement is called for.

Ultimately, water is vital to life, and certain water systems are of national strategic importance. Governments have a responsibility to manage water for the national welfare. This does not imply that the water system needs to be 100% in public ownership. It does, however, mean that appropriate laws, regulations, institutions and incentives should be in place to underwrite the public interest, and that governments stand ready to invest where the market will not.

Governments are, unfortunately, subject to shortcomings of their own, and it cannot be assumed that they are always efficient servants of the public good. 'Policy failures' are the public twin of market failures. The management of water is often fragmented between different agencies and parties, leading to conflict, confusion and mutually damaging tactics.

Water authorities and service agencies are often overextended and inefficient. They often fail to recover enough funds to cover essential operations, and there is often a growing backlog of unserviced consumers. Publicly owned companies and utilities are usually among the worst water polluters, whatever legislation is formally in place.

In short, a well managed water sector needs a balance of public and private involvement, recognizing the limits of both the market and government, and building on what each seems to do best.

THE WATER SECTOR AND ITS OUTREACH

The water sector embraces direct consumption and use of water, land drainage, flood relief, farm irrigation, fisheries, industrial and other abstraction, in-stream use of water for recreation, amenity, wildlife, etc., environmental protection, and disposal and treatment of sewage and industrial effluent.

It follows that decisions about water concern many interested parties – the 'stakeholders' – in the sector. The decision to use more water in agriculture, for instance, could affect power generation, municipal use, industrial offtake, in-stream uses such as fishing, navigation and recreation, and environmental purposes such as wetlands, deltas and game parks. These decisions could also entail major public health risks, such as the spread of malaria and bilharzia.

Apart from being the largest worldwide consumer of water, agriculture is also a major water polluter. Saline irrigation off-flows or drainage containing agrochemical residues are serious contaminants for downstream water users. Agricultural nitrate is contaminating groundwater in a number of areas. The disposal of liquid animal wastes pollutes surface and groundwater and is the main environmental problem in some intensively farmed regions.

Conversely, natural resources sectors such as agriculture, forestry and nature conservation can hold the key to improving the management of water resources. Certain kinds of farm practices, such as terracing and agroforestry, can help to preserve and improve the functions of watersheds and catchment areas. Afforestation, and sustainable management of standing forests, also has a vital part to play in the protection of upland water sources. Thus more careful use of water by irrigators can release supplies for the use of growing cities, or for hydropower or environmental purposes, while more diligent use of agrochemicals and better drainage practices would improve the quality of water for downstream users.

Water has an international dimension where countries share a river, lake, coast or aquifer. The issues are similar to those arising where the resource is of purely national concern, except that sovereignty is involved, international law is applicable, aid is often at stake, and countries may be willing to go to war to defend their interests. There is a serious risk of water becoming a *casus belli* in some of the arid parts of the world.

THE INTERNATIONAL DEBATE

Water issues have been the subject of increasing international concern and debate. From 26 to 31 January 1992, the UN system sponsored the International Conference on Water and the Environment (ICWE) in Dublin, Ireland. The ICWE called for innovative approaches to the assessment, development and management of freshwater resources. In addition, the ICWE provided policy guidance for the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil, in June 1992. UNCED highlighted the need for water sector reforms throughout the world.

In 1993, the World Bank issued a comprehensive policy paper defining its new objectives for the water sector. FAO recently established an International Action Programme on Water and Sustainable Agricultural Development (IAP-WASAD). Likewise, the UN specialized agencies, international non-governmental organizations (NGOs) and bilateral assistance agencies are all coordinating or participating in special programmes related to water resources.

The message highlighted by all these efforts is that water is an increasingly scarce and valuable resource. Of principal concern is the failure to recognize and accept that there is a finite or even diminishing supply of water. The consensus is that the growing water scarcity and misuse of fresh water pose serious threats to sustainable development.

PURPOSE OF THE GUIDE

The ultimate responsibility for formulating water policies rests with national authorities. Although professionals and specialists are drawn into policy reviews and decisions, politicians and senior officials, as well as professionals from outside the water sector, have a crucial influence. Hence it is important that the message is disseminated widely. This Guide is intended to:

- indicate the wide range, and ramifications, of water management, and the relationship between the 'water sector' and other parts of the economy;
- identify the principal issues involved in managing water resources, for the guidance of policy-makers;
- set out principles and criteria by which water resources can be managed;
- introduce some of the methods and processes entailed in a water policy review;
- illustrate how different countries have carried out such reviews, and how they have gone about implementing their findings; and, by means of the above,
- promote national policy and legislative reform, planning, and institutional development in the water sector.

TARGET READERSHIP

The Guide is addressed to all those likely to be involved in national water policy reviews. This includes ministers, their advisers, senior administrators and managers, and specialists and professionals. It should be read by those active in the water sector in its widest sense, as described above, not just those in directly water-related undertakings.

Some of its contents, addressed to a wider readership, will be familiar to water specialists. At the same time, it is intended that the latter would benefit from the introduction to the wider issues and principles at stake. Water is too important to be left to the specialists, so the reader is likely to become involved in a range of issues, such as:

- coping with growing water shortages both nationally and locally;
- establishing principles, or developing legal or negotiating frameworks, for defusing conflicts among water users;
- allocating scarce supplies between different uses, regions, and types of consumer;
- raising finance for investment in new water sources and recovering costs to meet recurrent operation and maintenance;
- dealing with the threats to public health from groundwater contamination and the pollution of surface water bodies;
- planning national food security involving irrigated farming;
- conducting international negotiations over the use and pollution of international rivers, lakes, and coastal waters;
- extending water, sanitation and wastewater disposal services to populations currently lacking adequate facilities;
- setting affordable and appropriate water quality standards;
- planning flood control and mitigating the harmful effects of floods;
- devising institutional reforms in this sector, such as commercialization and privatization; and
- drawing up appropriate environmental policies and standards as they affect water.

It is intended that the Guide would have some relevance to all such matters.

Chapter 2

Problems

This chapter begins by illustrating the scale of problems in the water sector worldwide, drawing on recent work on vulnerability. The problems of agriculture are specifically dealt with, since this sector, because of the scale of its water demands, is crucial to any solution. A general checklist is proposed to help in identifying the critical issues facing governments in this sector.

Some country case material is summarized to indicate circumstances in which various countries decided to undertake policy reviews.

GROWING WATER PROBLEMS: THE CONCEPT OF VULNERABILITY

Competition among agriculture, industry and cities for limited water supplies is already constraining development efforts in many countries. As populations expand and economies grow, competition for limited supplies will intensify and so will conflicts among water users.

The extent to which a region or country is vulnerable to water depends on the quantity of water, temporal distribution, quality, and the extent of its use and requirements. While climate is the principal factor in water quantity and its inter-temporal distribution, population and economic development are the main influences on quality and demand.

Although water quality and its inter-temporal distribution are difficult factors to measure for the purposes of international comparisons, the supply and demand for water can be calibrated both between countries and over time, and conclusions drawn about the vulnerability of the region concerned. Care should, however, be taken in the interpretation of data when making comparisons between countries in different climatic zones and different agricultural practices – for instance, a temperate country relying on rain-fed agriculture compared to one using irrigation.

The main factors affecting the supply and demand for water are depicted in Figure 1 (Kulshreshtha, 1993).

When annual internal renewable water resources are less than 1000 m^3 per caput, water availability is considered a severe constraint on socio-economic development and environmental protection. Table 1 lists the countries where per caput internal renewable water availability is expected to fall below 1000 m^3 by the end of the century. Most countries facing chronic water scarcity problems are in North Africa, the Near East and sub-Saharan Africa. Countries with less than 2000 m^3 per caput face a serious marginal water scarcity situation, with major problems occurring in drought years. By the end of the 1990s, water availability is expected to fall below 2000 m^3 per caput in more than 40 countries (FAO, 1993a).

In many countries, while scarcity is less of a problem at a national level, serious water shortages are causing difficulties in specific regions and catchment areas. Notable examples include northern China, western and southern India, and parts of Mexico, the United States of America, the United Kingdom and Italy.

FIGURE 1
Inter-relationships among forces determining a region's vulnerability to water resources. Water quality effects are excluded.

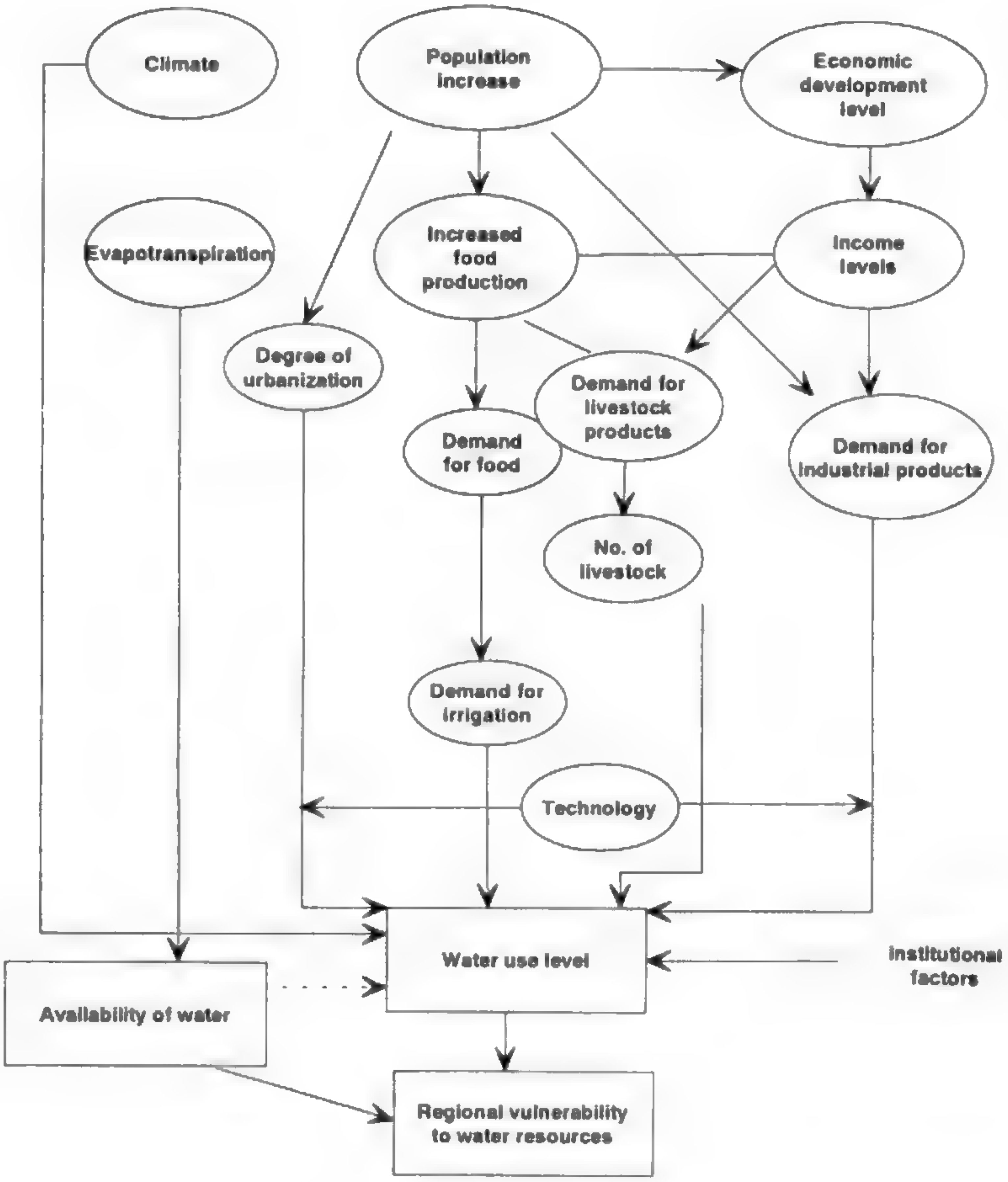


TABLE 1
Water-scarce countries in 2000

COUNTRY[1]	WATER AVAILABILITY m^3/person		POPULATION millions
	Internal renewable water resources	Including river flows from other countries	
Egypt	29	934	62.4
Saudi Arabia	103	103	21.3
Libya	108	108	6.5
United Arab Emirates	152	152	2.0
Jordan	153	240	4.6
Mauritania	154	2 843	2.6
Yemen	155	155	16.2
Tunisia	384	445	9.8
Syria	430	2 008	17.7
Kenya	436	436	34.0
Burundi	487	487	7.4
Algeria	570	576	33.1
Hungary	591	11 326	10.1
Rwanda	604	604	10.4
Botswana	622	11 187	1.6
Malawi	760	760	11.8
Oman	880	880	2.3
Sudan	905	3 923	33.1
Morocco	943	943	31.8
Somalia	1 086	1 086	10.6

Notes: 1. A number of countries with smaller populations, including Barbados, Cape Verde, Djibouti, Malta, Qatar and Singapore, are also included in the water-scarce category.
Source: FAO calculations based on World Bank and other data.

Despite water shortages, misuse of water is widespread. Small communities and large cities, farmers and industries, developing countries and industrialized economies – all are mismanaging water resources. Surface water quality is deteriorating in key basins due to urban and industrial wastes. Groundwater is polluted from surface sources and irreversibly damaged by the intrusion of salt water. Overexploited aquifers are losing their capacity to hold water and land is subsiding. Cities are unable to provide adequate drinking-water and sanitation facilities. Waterlogging and salinization are diminishing the productivity of irrigated lands. Decreasing water flows due to catchment area degradation are reducing hydro-electric power generation, pollution assimilation and fish and wildlife habitats.

AGRICULTURE – KEY TO THE PROBLEM

At first glance, many of these water problems do not appear to be directly related to the agricultural sector. Yet, by far the largest demand for the world's water comes from agriculture. More than two-thirds (up to 90 percent by some estimates) of the water withdrawn from the earth's rivers, lakes and aquifers is used for irrigation. With the growth of competition, conflicts, shortages, waste, overuse and degradation of water resources, policy-makers look increasingly to agriculture as the system's safety valve.

Agriculture is not only the world's largest water user in terms of volume, it is also a relatively low-value, low-efficiency and highly subsidized water user. The facts are forcing governments and donors to re-think the economic, social and environmental implications of large, publicly funded and operated, irrigation projects. In the past, domestic spending for irrigation dominated agricultural budgets in countries throughout the world. For instance, since 1940, 80 percent of Mexico's public expenditures in agriculture have been for irrigation projects. In China, Pakistan and Indonesia, irrigation has absorbed over half of all agricultural investment, and about 30 percent of all public investment in India.

A significant portion of international development assistance has also been used to establish irrigation systems. Irrigation received nearly 30 percent of World Bank agricultural lending during the 1980s. Spending commitments for irrigation by all aid agencies exceeded $US 2 thousand million annually in the past decade.

Once established, irrigation projects become some of the most heavily subsidized economic activities in the world, both directly and indirectly (taking account of low energy costs for pumping). In the mid-1980s, it was estimated that average subsidies to irrigation in six Asian countries covered 90 percent of the total operating and maintenance costs (Repetto, 1986). Case-studies indicate that irrigation fees are, on average, less than 8 percent of the value of benefits derived from irrigation.

Despite these huge investments and subsidies, irrigation performance indicators are falling short of expectations for yield increases, area irrigated and technical efficiency in water use. As much as 60 percent of the water diverted or pumped for irrigation is wasted (FAO, 1990). Although some losses are inevitable, in too many cases this excess water seeps back into the ground, causing waterlogging and salinity. As much as one-quarter of all irrigated land in developing countries suffers from varying degrees of salinization. Moreover, stagnant water and poor irrigation drainage escalate the incidence of water-related diseases, resulting in human suffering and increased health costs.

At the same time, irrigated agriculture is expected to produce much more in the future while using less water than it uses today. At present, 2.4 thousand million people depend on irrigated agriculture for jobs, food and income (some 55 percent of all wheat and rice output is from irrigated land). Over the next 30 years, an estimated 80 percent of the additional food supplies required to feed the world will depend on irrigation (IIMI, 1992).

However, agriculture is often unable to compete economically for scarce water. Cities and industries can afford to pay more for water and earn a higher economic rate of return from a unit of water than does agriculture. For the first time in many countries, agriculture is being obliged to give up water for higher-value uses in cities and industries. Irrigators in some areas are now asked to pay for the water they receive, including the full cost of water delivery.

This water dilemma – to produce more in a sustainable way with less water – implies a need for demand-management mechanisms to re-allocate existing supplies, encourage more efficient use and promote more equitable access. Policy-makers need to establish a structure of incentives, regulations, permits, restrictions and penalties to help guide, influence and co-ordinate how people use water, while encouraging innovations in water-saving technologies.

In the past, supply-side approaches dominated water resource management practices. Water itself was physically managed through technical and engineering means that captured, stored, delivered and treated water. However, the era of meeting growing demand by developing new supplies is ending. In the present-day water economy, resource management is shifting away from the goal of capturing more water towards that of designing demand- and user-focused approaches that influence behaviour. FAO has identified the following as some of the leading emerging issues (FAO, 1993a):

- National water politics are shifting from *projects* to *policies* – this trend is likely to continue and even accelerate.
- Water may become a test bed for economic reform, liberalization and accountability.
- Given water's scarcity and its value to cities and industry, the water subsector will be less dominated by irrigation, and its multipurpose uses will be more widely acknowledged.
- Irrigation is a *service* with customers and users; it is not a production industry.
- At the level of the irrigation scheme, the process of water policy formulation, assessment and appraisal needs to include more open groups that are representative of political, technical, managerial and (most important) water user associations.
- These policy groups would be consulted before policy selection and then provide feedback and adjustment in the light of experience.
- The policy groups would identify options consistent with the national policy framework, as opposed to measures to protect and satisfy special irrigation interests.
- The goal is to identify a broader range of water policy options, to have less 'policy by crisis' management and more resilience in the face of outside pressures.

Complementary and beneficial factors in the attainment of overall resource use efficiency, in the rural context, include rain-fed agriculture and management of catchments and fisheries, both capture and aquaculture. In Box 1, some policy aspects are put forward, both of sustainable mountain development and of inland fisheries and aquaculture.

BOX 1: COMPLEMENTARY RURAL FACTORS – WATER POLICY CONSIDERATIONS FOR: (1) MOUNTAIN DEVELOPMENT; AND (2) INLAND FISHERIES AND AQUACULTURE

1. MOUNTAIN DEVELOPMENT

Mountain countries produce 80% of the global water resources, while they represent only 10% of the population. Challenging the position that water is free but costs to serve, mountain populations are not compensated for protection of water resources used by downstream users and, as a result, water resources are degraded and not protected. Water needs to be managed not only in terms of scarcity but also as a diminishing resource, stressing the need for sustainability. Policy approaches could be royalties, such as in Colombia, where a part of the hydropower revenues are allocated to the upper catchments, and Lesotho, selling water as an economic good to South Africa. However, it is important to identify appropriate institutional arrangements to ensure that the funds are used for efficient catchment area and watershed management. In this context, more consideration needs to be given to existing customary rights. (UN-CSD, 1995)

2. INLAND FISHERIES AND AQUACULTURE

- Sustainable exploitation of living aquatic resources adds to the value of water resources and inland fisheries.
- Extensive aquaculture is non-consumptive of water.
- Inland fisheries and aquaculture require good quality water in good quantity.
- Fish are good indicators of water quality status.
- Inland fisheries suffers from environmental degradation and there is a focus on rehabilitation of perennial and seasonal water bodies.
- When reviewing and implementing water resource use and pricing policies, social and economic benefits of existing and future inland fisheries need to be considered.
- Institutional cooperation between water development agencies and fishery administrations needs to be strengthened to address common interests.

CHECKLIST OF CRITICAL ISSUES

In most cases, a water policy review will be undertaken in response to a single over-riding – and obvious – issue. Some typical issues are illustrated in the next section. However, even in these cases it will be important not to neglect other aspects of the water situation, which may be related to the prime issue, or may be growing in importance. In deciding what emphasis to give the water policy review, authorities may find it beneficial to use a general checklist, such as that in Box 2 below.

It is unproductive to attempt to offer guidance to national governments on how to assign relative weights to different issues. The absolute importance that different governments will place on the respective issues will vary and authorities will need to exercise their own judgments. In general, adverse 'scores' in any of the categories below could be the trigger for a review. Poor signals from most of the categories would indicate a serious state of affairs, underlining a need for urgent action.

BOX 2: CHECKLIST FOR CRITICAL ISSUES IN THE WATER SECTOR

1. SUPPLY-DEMAND BALANCE

- What have been the recent trends in the balance between the supply and demand of water? What is the evidence for this, e.g., the per caput availability of water and its use, or the net water balance? What proportion of available supplies is already committed?
- How do projected trends in population, food self-sufficiency and economic growth affect the supply-demand balance in future?
- How does the balance appear region by region? Are certain localities particularly vulnerable? How feasible is it to supplement their supplies from elsewhere?
- How often in the past has there been an absolute shortage of water necessitating emergency measures, such as rationing, restrictions on use, etc.?
- What trends have been observed in the real price of water, especially where markets operate to allocate scarce supplies?
- What is the quality of data used in the assessment of the water situation?

2. STANDARD OF SERVICE

- Are existing farmers being seriously constrained by the quantity, quality or reliability of water?
- What proportion of the population is not or only inadequately served with safe drinking water?
- What proportion of the population lacks safe sanitation and wastewater disposal facilities?
- What are the average levels of water consumption per head for different segments of the population? How do these compare with other countries in similar climatic circumstances and levels of development?
- What is the frequency and incidence of water shortages, breakdowns in treatment facilities, suspension of normal services, or rationing episodes? Is such evidence of systemic crisis more common in certain areas (e.g., poorer neighbourhoods, dry regions) than others? In rural areas, what proportion of wells and pumps are in working order?
- What proportion of the population regularly obtain their water from private vendors? Is there any evidence on what they pay?
- Is the quality of water provided for domestic purposes adequate? What is the evidence on the incidence of water-related illness? Do households take their own precautions to ensure the safety of their drinking water?
- Do farmers and industrial firms receiving public supplies insure themselves by the development of their own stand-by or supplementary sources?

3. ECONOMIC IMPORTANCE OF THE WATER SECTOR

- How important are water-intensive sectors in the national economy? (Include not only agriculture, heavy industry and processing, but also water-based tourism and recreation, and sectors sensitive to environmental quality.)
- What is the significance of irrigated agriculture to national food security, GNP and exports?
- What is the net contribution per unit of water used, or per unit of pollution, of heavy industrial water users and polluters to the economy (e.g., using an objective measure such as value added at world prices)?
- Is the economic contribution of the above sectors significantly reduced if account is taken of the environmental costs that they impose on other users, e.g., industrial pollution affecting fisheries, used irrigation water polluting rivers, etc.?
- Is water scarcity becoming a constraint on the expansion of any major sectors?

4. WATER QUALITY INDICATORS

- What is the level, and trend, in key water quality indicators at sensitive locations?
- Are water pollution standards being observed, or widely ignored?
- Is information available on the quality of groundwater (especially near potential polluting activities such as intensive agriculture, livestock, solid-waste disposal sites, etc.)?
- Is there any indirect supporting evidence, such as the incidence of water-related diseases?
- What proportion of irrigated land is affected by salinization and waterlogging? How is this affecting yields?
- Are there international implications in the quality of water discharged?

5. FUTURE SUPPLY OPTIONS

- Are the water authorities obliged by law to provide water of a certain standard?
- Are future water supply options significantly more difficult, costly or environmentally damaging than recent and current projects?
- Do they entail difficult international negotiations, or risk breaching international agreements?

6. EFFICIENCY OF USE

- How efficiently is water used by the different sectors, according to relevant technical or international yardsticks?
- How does irrigated agriculture perform when assessed by:
  - system efficiency, e.g., the proportion of water entering the system actually applied to crops (rather than lost through evaporation and leakage);
  - agronomic norms, e.g., the amount of water applied per hectare of a particular crop, or crop output per cubic metre of water supplied; and
  - economic measures, e.g., the average and marginal economic values per unit (m^3) of water used.
- What proportion of wastewater is treated and recycled for further use, e.g., industrial wastewater, domestic sewage?
- In urban systems, what proportion of water entering the system is unaccounted for (UFW)?
- How prevalent are water-efficient consumer appliances (e.g., low-flush toilets)?
- In water-scarce communities, what proportion of consumption is accounted for by non-essential uses in relatively affluent areas (e.g., car washing, garden watering)?
- Could measures to improve the efficiency of water use in the various sectors be taken relatively easily and at low cost - compared to that of developing new supplies? In that case, what are the obstacles to taking such measures?

7. FINANCIAL PERFORMANCE OF SECTOR

- Does the water sector, or important parts of it, generate large and growing fiscal deficits?
- Does the sector, or important parts of it, fail to cover its recurrent costs of operation and maintenance?
- What are the prospects of the sector generating its own funds for future investment in replacement and expansion of facilities?
- What are the prospects of the water sector attracting external concessionary funds to finance planned and required development?

8. INTERNATIONAL SENSITIVITY AND COMMITMENTS

- Is there a significant international dimension to any of the decisions to be made about water?
- Is the country party to a relevant international treaty, e.g., over the sharing of the waters of a common river, the use of water from a dam, prior claims on a water body in the event of a shortage, the Ramsar Convention on Wetlands, etc.? Is there a need to prepare for future treaties of this kind?
- Might decisions about water affecting another country provoke a reaction, with substantial diplomatic, political or economic cost?
- Could the abstraction from, or pollution of, water in an international water body expose the country to legal suits from private citizens or public bodies elsewhere?
- Will current trends in water use, or future decisions about water, significantly increase the country's dependence on other countries, or on aid?

9. SYMPTOMS OF CONFLICT

- Is there evidence of growing competition for water between different regions, sectors, or uses?
- Are customary attitudes and practices breaking down, such as communal cleaning of irrigation canals?
- Is this competition being resolved in a relatively productive way (e.g., through the development of markets, price changes, acceptance of effective integrated planning, the growth of water-efficient behaviour), or is it leading to litigation, illegal actions, hardship, or civil unrest?
- Is the allocation of scarce water being done in ways which safeguard the legitimate interests of the poor and needy, serve public health, and ensure its most productive use?
- Is environmental stress increasing, e.g., desiccation of wetlands and aquifers, saline intrusion into groundwater, erosion of deltas and coastlines through upstream water abstraction, loss of water-based wildlife, damage to amenity and recreation, etc.?

10. STRUCTURAL AND INSTITUTIONAL CHANGE

- Is the government committed to legal and institutional changes affecting the water sector, e.g., as a result of election pledges, structural adjustment programmes, government decentralization, or the need to reduce budget deficits or public sector payrolls?
- What will be the implications for water of projected reforms in land tenure, water rights, etc.?
- Is privatization scheduled for the water sector? What form is it likely to take?

REASONS FOR POLICY REVIEW

Any of the above problems would be sufficient to trigger a major review of water policy. Box 3 illustrates factors that were important in starting the process in recent cases, and Chapter 6 discusses some of the modalities chosen by the countries in Box 3 to carry out their reviews, and their main policy outcomes.

BOX 3: WATER POLICY REVIEWS: RECENT CASES

BELIZE. The priority water issues in Belize were declining water quality and fragmentation of water resources management. A water sector review was initiated in a national meeting and furthered by the establishment of an inter-ministerial *Pro-Tempore* Water Commission to prepare draft national water resources policy and give recommendations for institutional and legal arrangements.

CHILE. There was a growing realization that the balance between supply and demand for water was becoming critical, and that water pollution was becoming very serious. The immediate trigger for the review was the Administration's concern about the disproportionate amounts of water tied up in private hands because of existing legislation, frustrating the Government's aim of managing the resource more rationally. Another leading issue was the impotence of legislation to address the disparity between the dry north and the water-rich south.

FRANCE. The background to the 1992 Water Act was a growing imbalance between available resources and a number of competing demands, aggravated by a series of dry years. There were also concerns about the deterioration in the quality of surface and underground water, and the challenge of meeting the quality standards laid down in EC directives.

INDONESIA. Rapid economic growth has caused increasing competition for water among industrial, urban and agricultural consumers. The growing scarcity of water in certain regions and the degradation of water quality were threatening to hamper future economic development, and the Government wished to take a long-term view on its water resources. Different institutions dealt with surface and underground water, and quality. There was little relationship between land use and the availability of water. Little control was exercised over serious non-point pollution from urban, industrial and agricultural users. The time of the review coincided with the Government de-centralization programme and formulation of the long-term, 25-year Development Plan.

LITHUANIA. This former Soviet bloc country was in transition. National water and land resources legislations were being reformed, which prompted a review of national water policy. The policy was related to water quality control, changing agricultural practices and land-use policy, with implications for de-centralization of water administrations and privatization of water works.

MEXICO. The underlying reason for the creation of a National Water Commission in 1989 was the emergence of serious imbalances between the supply and demand for water on a regional scale. There was a particular conflict between urban and agricultural consumption.

TURKEY. With the goal of sustainable and environmentally sound water resources development, the reasons for the national water sector policy review were concern about growing regional imbalance between water demand and availability, and the burden of providing water to cities and irrigation, with changing water uses and excessive investment programmes in the water sector. The main resulting documents and actions were the 1983 Law of Environment, the 1984 Law allowing the private sector to build and operate schemes, expanded in 1994 to cover the water supply subsector, and amendment in the legislation to facilitate transfer of O&M equipment to private users.

UNITED KINGDOM. One of the crucial events launching the United Kingdom on its course of full privatization for England and Wales was a dispute over the financial obligations of the statutory water authorities, specifically the terms on which Thames Water should repay a government loan. Soon afterwards the Government issued a White Paper on Privatization. Another background influence was the anticipated high cost of meeting EC water quality standards and of renovating the nation's old sewerage system.

YEMEN. The main symptoms of the problems that gave rise to the review were rapid depletion of groundwater and a consequent decrease in food production, and growing conflicts among various types of water user. Underlying these symptoms were problems of the lack of regulation of exploitation of a common property resource, the undermining of efficient customary and tribal systems of control, fragmentation of government responsibilities and institutions, which resulted in two parallel and incompatible draft water bills.

Chapter 3

Principles

The chapter begins by expounding the concept of water as a scarce (i.e., economic) good, together with some of the reasons why it is not treated as such. The economically efficient use of water is one of the basic principles recommended for policy review, together with the criteria of efficacy, distributional impact, environmental impact, fiscal implications, acceptability, sustainability and feasibility.

Some implications of these criteria for policy reform are discussed, both generally and for the agricultural sector. The thrust of policy reforms is in line with existing trends in agricultural policy. Some strategic choices and trade-offs are then described, such as inter-sectorial priorities, food self-sufficiency, international diplomatic issues, the choice between centralized and de-centralized, and public and private management styles, and between supply-oriented and demand management policies.

WATER AS A SCARCE RESOURCE

Despite its widespread scarcity, the majority of societies do not treat water as an economic good or service. If water were treated like other commodities it would be priced to at least cover its cost of supply, including storage, treatment and distribution, so as to ensure its continuing availability. The price should also be sufficient to reflect the strength of demand, to encourage its consumption to gravitate towards those placing the highest value on it, provided essential supplies were assured to all. It should not exceed the payment ability of those needing water, including the poor.

Commodities are bought and sold in markets. Private agents are active in their supply and distribution. In a well-functioning market, the benefit attached to the use of the marginal unit of the commodity (the last one to be sold) is the same for all consumers, so that general welfare cannot be increased by a re-allocation.

These conditions are evidently not those under which water is supplied and used in most cases. The water sector is typified by supply-oriented provision, reluctance to make active use of pricing, allocation by non-economic means, and the persistence of low-value usage in important sectors. Although farmers and industrial firms frequently develop their own water supplies, individually and cooperatively, and private vendors are active in many cities, private enterprise in the supply of urban and rural drinking water systems and large irrigation schemes is the exception rather than the rule.

In most countries, the instinctive response to water stress is to consider supply augmentation. Prices are rarely used to allocate water supplies or to actively manage demand. Water pricing is usually seen purely as an aspect of cost recovery, and in many cases, not only in agriculture, but also in urban supplies and sanitation, does not even achieve that. The resulting paradox is that an increasingly scarce resource is subsidized, discouraging conservation or the reduction of waste. The average tariff in World Bank-financed water projects – probably a better-than-average sample – is only about one-third the average incremental cost of supply.

Most authorities respond to scarcity by non-price devices, such as rationing, prohibited uses, exhortation, or the cutting-off of supplies. Although these can be effective, they can also be costly and inconvenient to users, and do not take account of the relative value of water in different applications.

The benefits from using water typically vary widely from one sector to another, as well as within sectors. Variations up to a factor of 10 or more are common in comparing the value of water for different uses **within** the industrial and agricultural sectors, and similar differentials apply in comparing municipal and agricultural use values (Bhatia and Falkenmark, 1992). In general, the highest-value water uses are found in speciality crop production, industrial process use, in-house domestic consumption and some recreational uses. The lowest-value consumption tends to be found in low-value farm crops, industrial cooling, and waste assimilation (Gibbons, 1986). This indicates the scope for increasing the total benefit from water consumption by re-allocating scarce supplies.

Another sign of the underdevelopment of markets is the minor role played by private enterprise in bulk supply and distribution. It is no accident that privatization has made least headway in the water sector, and, except in the United Kingdom, it has largely taken the form of concessions and management agreements, rather than full-blooded ownership.

Strong vested interests dependent on cheap water conspire to preserve the status quo. Irrigated agriculture, and industries reliant on large volumes of water or cheap hydropower, can exercise great political influence.

Sometimes the development of a more integrated water market is hampered by physical factors. There may be no practical method of transferring water which is surplus to one sector – or used wastefully – to another which could make more economic use of it. In the neighbourhood of Beijing, surplus agricultural water would need to be collected from groundwater wells and pumped uphill to the city. This sets a limit on how much could be transferred.

Physical barriers to the development of water markets are often underscored by legal obstacles, arising from the prevailing set of property rights. Specific users may have legally-defined rights over the use of water, which lapse if they do not use it for the specified purpose. In other cases, ambiguity over the ownership of water prevents its transfer from one customary user to another. The rights of third parties (including the public interest) in water transfer cases is another consideration, and, indeed, is a necessary part of 'internalizing' environmental concerns into the transaction.

Shifting water onto a more market-oriented basis entails transitional costs, which can be heavy. Metering involves a sizeable resource cost, which has to be weighed against expected water savings. Industries may need to spend sizeable amounts on recycling equipment, or even introducing an entirely new, water-efficient process. In households, campaigns to promote water-efficient devices are costly and time consuming. Socially, ensuring the transfer of water from one sector to another may be disruptive (e.g., may lead to a decline in irrigated farm communities).

There is also a lack of faith in the efficacy of economic instruments. It is widely believed that the price elasticity of demand is simply too low for water pricing to do an effective job in restraining demand and re-allocating supplies. This view is based on an era when water prices were too low to be registered as significant by the majority of consumers. A growing body of evidence from both developed and developing countries, principally in the urban and industrial sectors, shows that consumers do respond to water prices where they are set realistically. Where pricing is used actively in agriculture – e.g., for groundwater sales and in water transfers – there is evidence that farmers respond as economists would predict (Winpenny, 1994).

Economic treatment of water, especially pricing, should be in balance with water as a social good, considering the basic needs of the poor and their limited ability to pay for it. In this context – and far from simple provision of clean water for households – a major role in some countries is provision of water for irrigation to fulfil the basic need for food.

PRINCIPLES FOR WATER PLANNING AND ALLOCATION

In the previous section it was argued that recognizing the growing scarcity of water should be an underlying principle in all attempts at reforming this sector. In other words, water should be treated as an economic resource.

However, a number of other criteria – which are often inter-related – come into play in planning and managing water systems, and different countries will place varying emphases on these. They include:

- effectiveness,
- efficiency,
- equity and distributional effects,
- public health and nutrition,
- environmental impact,
- fiscal impact,
- political and public acceptability,
- sustainability, and
- administrative feasibility.

Other criteria may also be relevant in particular circumstances, e.g., impact on food self-sufficiency, regional development, the urban-rural balance, a desire for self-sufficiency in water, etc.

These criteria are briefly discussed below.

EFFECTIVENESS

Water is a sensitive topic in most societies. Reforming public behaviour towards water is an invidious and difficult task, with substantial political and administrative costs. It is therefore important that policies should have a commensurate 'pay-off' in the effective fulfilment of their goals. Efficacy is thus related to the criterion of acceptability, discussed below.

In the case of increases in the price of water, the clearest measure of response is the elasticity of demand in respect of changes in its price. There is growing evidence that certain categories of demand are elastic enough, in this sense, for price changes to induce demand responses. Even where demand is price-inelastic (where the amount consumed changes less than proportionately to the price increase), prices can still be successful in reducing consumption, compared to other options for balancing supply and demand.

In many instances, a combination of measures might be most effective. Higher charges for water use might be accompanied by a campaign of public information and education, subsidies for the installation of water-efficient facilities, and free advice on reducing consumption and waste. The effective control of water pollution could entail the combination of regulations ('command and control' devices) - properly enforced - with 'polluter pays' taxes and charges.

EFFICIENCY

The efficiency criterion requires that the economic benefits of policies exceed their costs. For instance, in the case of the development of new water supplies, the value of the water produced should exceed the costs of production, to which should be added environmental costs. For conservation measures, the reduction in consumption is worthwhile so long as the unit value of the water saved exceeds the cost of providing it. Beyond that point, conservation has too high a cost in terms of benefits foregone (Winpenny, 1994).

Efficiency also applies to policies involving the re-allocation of water between different users, e.g. within the agricultural sector, or from agriculture to municipal or environmental use. Re-allocation to higher-value uses produces net social benefits corresponding to the difference between the value of water in its old and new uses.

In the implementation of policies, attention must be paid to the perceived need of community members that have generally been in tune with the natural limits of scarce resources. There is a risk that cultural considerations are eroded by economic and engineering concepts.

EQUITY AND DISTRIBUTIONAL EFFECTS

Policies should be seen to be 'fair' in their respective impact on the various socio-economic groups. Deserving groups, who may be mothers of young children, poor households or small farmers, previously receiving supplies considered to be inadequate or obtained at high personal or social cost, should benefit from policy reforms, and should certainly not find themselves worse off. It is important that the consumption of such target groups should not be reduced to below socially desirable levels.

Poorer groups in society, with less influence and voice, tend to get low priority in the public provision of water services. Poorer farmers are often at the tail end of irrigation systems, where supplies are unreliable. Poorer urban consumers tend to be last in the queue for getting piped supplies and sewerage. Where conventional policies for water supplies often fail the poor, demand management measures may be helpful in comparison. For instance, the poor may pay less for piped and metered supplies, at an economic tariff, compared to what they now pay to private vendors.

The effects of a huge financial gap in the water supply subsector and the call for continued subsidies for poor areas makes equity closely related to the criteria of public health and fiscal impacts.

A related concern is that more affluent consumers should not receive disproportionate benefits from any policy measures, and that extreme inequalities in water consumption should be reduced.

PUBLIC HEALTH AND NUTRITION

Despite the achievements of the International Drinking Water Supply and Sanitation Decade (1981-90), over one thousand million people lack access to safe water, and 1.8 thousand million do not have proper sanitation (World Bank, 1992). The backlog is rising in absolute terms.

It has been authoritatively asserted that inadequate sanitation and clean water provision remain the most serious of all environmental problems, in terms of the scale of human suffering (World Bank, 1992). Universal adequate water supply and sanitation would benefit hundreds of millions of present sufferers from such diseases as diarrhoea, roundworm infection, schistosomiasis, trachoma and guinea worm (World Bank, 1992).

These estimates indicate the importance of public health **benefits** in planning water systems to provide adequate universal coverage of water supply, sanitation and safe disposal. However, there are also public health **risks** entailed in certain water supply schemes – e.g., the creation of malaria-breeding habitats, the spread of bilharzia in irrigation schemes, increased pollution from greater water use, etc.

In applying the public health criterion to water supply, there should be adequate recognition of the benefits to national nutritional levels from having adequate food security based on local irrigated farming.

ENVIRONMENTAL IMPACT

The environmental impacts of schemes to supply, use and dispose of water are potentially very large. Dams and reservoirs, aqueducts, river diversions, major irrigation schemes, industrial and municipal offtake, groundwater pumping, etc. can have a massive hydrological impact affecting other users, future generations, amenity and wildlife. Likewise the disposal of wastewater and the contamination of freshwater bodies through agricultural runoff, industrial effluent and unprocessed sewage.

Where possible, these environmental effects should be included in the course of project appraisal. Environmental effects should be factored into the economic appraisal, either as costs or credits, using recognized techniques (Dixon *et al.*, 1988; Winpenny, 1991). In practice, only certain effects can be quantified, and even those only partially and imperfectly. The environmental effects of policies may also be difficult to capture in numbers, though they should be rigorously tracked using recognized checklists, such as the *Environmental Assessment Sourcebook* (World Bank, 1991).

Environmental criteria apply with particular severity to large new schemes for water supply development. Less obviously, non-physical projects, such as new policies and programmes, including structural adjustment and sectorial reform, also may have significant impact on the environment. Demand-management measures, such as conservation, are much more environmentally benign, avoiding the major impact of supply projects and reducing costs resulting from pollution.

FISCAL IMPACT

Many countries with serious water problems also have weak public finances. The fiscal impact of water policies is an important criterion, both for general macro-economic management and for the proper funding of water and sanitation provision. A sustainable policy would be one having a positive impact on the finances of central or local government, e.g., from a tax, a price increase, a charge, a reduction in subsidies, or the avoidance of major capital spending. It should likewise benefit the financial position of the water utility, irrigation agency, etc.

The strict application of economic water pricing, based on the 'marginal cost' principle, could even generate 'excessive' revenue for the water utility compared to the alternative of average cost pricing. These revenues could breach allowable rates of return established by regulatory bodies, and could arouse antagonism amongst the general public. In such cases, total revenue could be adjusted by lowering consumer charges unrelated to consumption, e.g., the fixed part of a two-part tariff, or by reducing the price of the first 'blocks' in an 'increasing block' tariff structure.

The fiscal yield of a specific price adjustment depends on the price elasticity of demand. Although elasticities vary greatly for different categories of consumption, most aggregate estimates have values less than 1.0. Where this is the case, tariff increases will increase total revenue.

POLITICAL AND PUBLIC ACCEPTABILITY

It is desirable that policy changes should be acceptable to the parties affected and should not encounter serious resistance in the political process. However, this is a counsel of perfection and there would normally be gainers and losers in any policy change. Nevertheless, the ground needs to be carefully prepared. There should normally be some proportionality between the effort that goes into introducing a policy measure (the sacrifice of political goodwill, expenditure of political credit, the resources involved in steering legislation through, overcoming public resistance and lobbying, etc.) and the pay-off from that policy. A policy that achieves little, but at great political cost and arousing much public antagonism, is clearly undesirable.

A policy is more likely to be acceptable if it is seen to be tackling a severe problem, if its costs and benefits are apparently equitably distributed, if there is a strong lead from prominent political and community figures, if it is accompanied by adequate publicity, and if the population is well informed and public-spirited.

There may also be concern regarding unintended negative impacts from the conflicts of policies at cross-purposes, as well as from direct water policy action.

It will therefore be tempting for politicians to support policy for a preventive rather than a mitigative approach, and to steer clear of a policy that relies on major behavioural changes (e.g., introduction of pricing or conservation measures), compared to one consisting of a technological 'fix' (e.g., the development of new supplies). However, the former may be preferable in the longer term.

SUSTAINABILITY

Certain policies have a once-and-for-all impact, while others have a continuing or even a growing effect. Short-term measures introduced in response to an emergency, such as a drought, may have a strong immediate impact, but one which tails off sharply when the worst of the emergency is over. Policies which make a long-term impression on water use, such as technological adaptations and changes in user habits, are more sustainable.

Best of all are measures whose impact increases over time, because their elements reinforce each other, or because they provide incentives for continuing and cumulative effects.

ADMINISTRATIVE FEASIBILITY

Operating a policy must be within the administrative capability of the department or agency involved. For instance, metering supplies requires a certain level of household visits, and billing staff. A drive for conservation needs to be backed up by qualified staff to advise households, industries or farmers on technology and improved water management and use. By the same token, supply augmentation schemes are not the easy option they may appear if they require intensive monitoring and maintenance.

New policies will be worthless unless their implementation is monitored and enforced. For instance, the system of water transfer practised in some states of the USA requires official approval for each transaction. The control of water pollution implies regular monitoring and inspection, and a willingness to penalize the offenders. Water pricing requires regular collection of revenue and a willingness to prosecute non-payers, coupled with appropriate administrative arrangements for funds collected to be channelled back to the water system.

POLICY REFORM IN AGRICULTURE

Sustainable agricultural development depends on sustainable water use. Governments today recognize that the search for sustainable economic growth requires, in part, both economy-wide and sector-specific policy reforms. Economy-wide policies attempt to create a favourable macro-economic environment, while water sector policies, for example, seek to encourage resource efficiency among water users.

The current emphasis on macro-economic policy reforms and economic liberalization has several important implications for irrigation. Recognition of the value of water (and the high cost of turning a water source into a service delivered to a farm) makes the water sector a prime target for further policy reforms. Nonetheless, irrigation remains a resource-hungry sector in this transitional period. Even successful irrigation consumes large quantities of capital and foreign exchange and ties up scarce skilled personnel.

Like many public sector personnel, irrigation managers must walk a fine line between a tighter control of finance, the need for more positive active leadership and better planning of resource allocations, on the one hand, and the contradictory need for more ideas from below (farmer customers) on the other hand. Financial pressures are likely to be the dominant influence. Irrigation as a public-sector agency still relies on budget allocations to obtain financing. Many argue that this gives little incentive to save money and may, in fact, have the reverse effect.

As private-sector disciplines are applied in irrigation, and more user participation occurs, policy-makers are finding that:

- agencies become more supportive of farmers' own efforts and less inclined to make all key decisions before informing farmers accordingly;
- management seeks more consensus on priorities, more information about the basis of decisions, and a common view of external factors affecting management;
- irrigation schemes seek and receive more autonomy;
- the financial responsibilities and accountability of managers increases; and
- managers shift focus from their ministries and governments, depending on the amount of finance generated by service fees. (FAO, 1993a)

STRATEGIC CHOICES AND TRADE-OFFS

Many countries confront the prospect of emerging water scarcity in the long term, and for some that spectre is already upon them. Difficult choices have to be made in such areas as the following:

Priorities between sectors

Against the background of increasing population, growing food requirements, industrialization and urbanization, the competing claims of agriculture, industry and household water consumption need to be mediated. Other important claimants are hydropower, navigation, flood control, fisheries, recreation and the environment.

Water or food import?

A water-scarce country pursuing food self-sufficiency may be forced to import water at some point. If water becomes the scarce factor, it may be more sensible to 'import' it embodied in food, especially if food is available on favourable trade terms. Egypt, a water-scarce country, regularly imports food (Allan, 1992). California obtains 73 percent of its daily water input by importing food, though it also 'exports' water by selling cotton, fruit and vegetables (Comeau, 1993).

Domestic versus international concerns

The domestic water policies of a number of countries are placing them on a collision course with their neighbours. This applies both to the use of a common river or lake, and to the pollution of a shared water body. Upstream users are in a naturally stronger position, and could even use their water policies to exact concessions in other spheres. However, if they press their advantage too far, they face potential international financial and diplomatic sanctions, and ultimately armed force. Downstream users can, by their own water policies, increase their dependence on their upstream neighbours, to their eventual cost.

Management mode

There are many ways of managing national water resources, but one basic choice is between centralized and de-centralized management and control. The former could take the shape of river basin authorities, as in France; the latter could take the form of power vested in a number of regional, urban or functional agencies and utilities doing deals with each other, as in California. Political traditions and power structures, and the balance between the centre and the regions, will influence which model is preferred.

Another strategic choice is over the relative roles of the public and private sectors in operating the water industry. Although operation by public departments or utilities is still the norm, an increasing number of countries are privatizing operations. There is the further choice of allowing private companies full ownership of assets, as in the UK, or admitting them as concessionaires, with assets remaining in public ownership, as in France.

A further decision has to be made over management **style**, which polarizes between authoritarian (e.g., irrigation authorities in some South Asian countries) and participatory (e.g., water users' associations).

POLICY MIX

Doing nothing, or postponing any changes, is always an option, and may be perfectly rational in some cases. However, while the costs of inaction should not be ignored, it offers a useful reference against which to judge the impacts of proposed policy actions. If action is to be taken, a basic choice is between supply-oriented policies and those focusing on demand management.

A further option is the use of 'command and control' measures (regulations, quotas, instructions) rather than economic instruments relying on incentives (prices, taxes, fees, markets). In practice, the choice will be over the **balance** between the two types of measure, both of which are necessary.

Chapter 4

Methods and processes

This chapter focuses more sharply on how to carry out water policy reforms, and more precisely on what to do, consistent with the general principles discussed in the preceding chapter.

It begins by stressing the value of a holistic approach – one that recognizes the far-reaching and inter-sectorial character of decisions about water. It goes on to examine the components of a policy review, and some of the key processes and methodologies that it entails.

The various kinds of actions required are categorized. As part of the discussion on planning and analysis there are sections on information gathering, forecasting, modelling, integrated planning, natural resource accounting, and policy analysis matrices. Among legal and institutional reforms, the main topics are legal reforms, institutional reform and re-organization, and participation. Economic measures include macro-micro links, and the creation of incentives, which in turn break down into tariffs and pollution charges in various sectors, non-price measures, promotion of water markets, banks and auctions, and the use of prescriptive norms.

Under the subheading of projects and programmes there is a discussion of how the appraisal, selection and design of projects must adapt to the needs of a new strategy, with sections on cost-benefit and cost-effectiveness analyses, environmental assessment and financial management.

A HOLISTIC APPROACH

The ICWE and UNCED called for a new approach to the assessment, development and management of freshwater resources. The proposed approach involves the management of fresh water as a finite and vulnerable resource and the integration of sectorial water plans and programmes within the framework of national economic and social policy (UN, 1992).

A more integrated and broader approach to water sector polices and issues is important because of water's special nature as a unitary resource. Rainwater, rivers, lakes, groundwater and polluted water are all part of the same resource, which means global, national, regional and local actions are highly interdependent (Rogers, 1992). Water use in one part of the system alters the resource base and affects water users in other parts. Dams built in one country frequently reduce river flows to downstream countries for years afterwards, thereby affecting hydro-electric and irrigation capacity. When a city overpumps a groundwater supply, streamflows may be reduced in surrounding areas. Some human actions at local levels may contribute to climate change, with long-term implications for the hydrological system worldwide.

BOX 4: POLICY ANALYSIS MATRIX

Action categories	Components

1. PLANNING AND ANALYSIS

Objectives: to collect data on the water sector; to analyse it in the light of national water needs; to formulate a national water strategy.

Analytical framework	National water strategy
Information systems	Water resources assessment Data banks Monitoring systems Models Research

2. LEGAL AND INSTITUTIONAL

Objectives: create the right 'enabling environment' for the strategy, set up a legal framework in which rights and obligations in respect of water are clear and which facilitates its rational use, set up institutions and management responsibilities consistent with the strategy; ensure appropriate regulations are in place.

Legal framework	Laws clarifying ownership and rights
Institutional reform	New authorities Coordinating bodies Responsibilities of utilities Privatization
Management structures	O&M reviews Delegation, user groups
Regulations	Water quality Environmental standards Regulation of private sector Abstraction

3. ECONOMIC REGIMES

Objectives: to ensure that macro economic and sectorial economic policies support the water strategy; create specific incentives for the careful use of water.

General economic policies	Agricultural support Food self-sufficiency Industrial promotion New settlement
Incentives	Prices Conservation Markets Trading Pollution charges

4. PROJECTS AND PROGRAMMES

Objectives: to select, appraise and design projects and spending programmes systematically, and consistent with the national strategy.

Public investment schemes	Project appraisal
Water efficiency programmes	Environmental assessment
Information campaigns	Financial management

Water policies, laws, projects, regulations and administrative actions often overlook these linkages. Governments generally tend to organize and administer water sector activities separately. Surface and groundwater resources are often managed by separate units; and water quality and quantity are the responsibilities of different sectors. Thus one department is in charge of irrigation; another oversees domestic water supply and sanitation; a third manages hydropower activities; a fourth supervises transportation; a fifth controls water quality; a sixth directs environmental policy; and so forth.

These fragmented bureaucracies make uncoordinated decisions, reflecting individual agency responsibilities that are independent of each other. Too often, government planners develop the same water source within an interdependent system for different and competing uses. This project-by-project, department-by-department and region-by-region approach is no longer adequate for addressing water issues.

A more integrated approach to assessment and planning obliges water managers to understand not only the water cycle (including rainfall, distribution, ecosystem interactions and natural environment and land-use changes), but also the diverse inter-sectorial development needs for water resources. A major thrust of national water resources policy is therefore the integration of sectorial activities that impinge on water resources management and development.

CATEGORIES OF ACTIONS

In keeping with a holistic approach to the water sector, the various kinds of actions can be grouped into four main categories: planning and analytical; legal and institutional; economic regimes; and project and programmatic. Generally speaking, a water policy review will entail some actions in all these categories, but the balance of activities between each category will obviously vary from country to country, as will the detailed measures taken. These categories, with some of their respective components, are illustrated in Box 4, and further discussed in this section.

PLANNING AND ANALYSIS

Methodologies and tools for water policy analysis

There is a danger of water policy reviews being 'technique-driven.' Certain methodologies – particularly those drawing on large data sets and entailing modelling and optimization simulations – are attractive to professionals and allure policy-makers because of their quasi-scientific basis. However, rather than the sophistication of a method it is more important to ask about its relevance to the specific objective in hand, and its credibility in particular social, political and economic contexts.

Data requirements

Water policy formation is very data-intensive. However, data on water supply tend to be poor, while information on demand is often based on gross estimates. This means that the construction and interpretation of, for instance, water supply and demand balances needs great care.

Hydrological information on water supply and water quality is expensive to obtain and interpret. The repercussions of major new structures and works have to be meticulously examined. The needs and attitudes of consumers have to be ascertained, by survey in some cases. However, data gathering should not become an end in itself. Decision-makers should always ask, "What is this information for?" and, "Is this the most cost-effective way of obtaining it?"

There are two main sets of information to be established to provide the basis for policy making, planning, implementation and monitoring of the results, namely, an inventory of resources (location, quantity and quality), and an inventory of current diversion and in-stream uses.

In gathering data on *resources,* there is likely to be a disparity between information on water supply, on the one hand, and water quality, on the other. While problems of water supply are widely recognized as an issue in water resource planning and management, the problems of water quality are insufficiently acknowledged. River quality is, for example, very complex and great simplifications are needed for practical planning purposes. As the worst quality at any point is far more significant than the best or average quality, it is important to have data on maximum or extreme values.

The inventory of current *diversion and in-stream uses* should cover aspects of location, quantity, quality and the state of information in each case. The most important categories are likely to include: urban and industrial water supply, conveyance and disposal of wastewater, agriculture, flood protection, aquaculture and fisheries, hydropower, navigation, tourism, recreation and amenity, protection of the human and natural environments, and defence.

Because of the size and longevity of many investments in the water sector, it is essential to take a long view of trends in the sector. *Forecasting future requirements* would normally mean taking 25- to 50-year scenarios of supply and demand. Extrapolating current and recent trends in demand is pointless if these are unsustainable, and if changes in behaviour are likely to be called for. Hence demand projects need to be **iterative**: if the first few demand and supply scenarios are clearly unworkable, scenarios including demand management and price elasticities should be introduced. In most cases it is unrealistic to assume unconstrained demand for water.

Obtaining the information

There are a number of aspects to consider:

Right of access to information: It may be readily available, or it may need persuasion or require compulsion to obtain. Holders of information on water may regard it as sensitive and want to impose confidentiality in its use.

Information requirements: Gathering and processing can be a huge task, so requirements should be kept to the minimum required for the strategy, and gathered cost-effectively. Data should be disseminated to those who really need them, to avoid duplication and wasted effort.

Information quality: Good quality information is essential. Data are often inaccurate and potentially misleading, unless an effective information system has been in place for some years. Forecasts based on misleading historic data will be false. The motives of those giving information should always be considered. Water users who expect to benefit from improved provision but not to pay for it will have an incentive to exaggerate their requirements.

Abbreviation and simplification: Specialists should reduce and simplify their information and, especially, tune it to the specific needs of policy-makers, to maximize its effective use. Generalists, for their part, must give the specialists clear guidance on what information they need.

Box 5 summarizes key questions to ask about water data.

BOX 5: CHECKLIST OF QUESTIONS ABOUT DATA

- How is access to the required information to be obtained? Are the owners of data obliged to divulge them? If not, how can they be persuaded to cooperate? Where information has to be bought, what is the cost, and what is the most cost-effective way of obtaining it?
- What are the minimum information requirements and how is information to be managed and disseminated to those who need it?
- What standards of information quality are required and how are they to be achieved?
- What requirements are there for simplification and condensation of information for policy making and planning?
- How is additional information gathering and monitoring to be planned, financed and implemented?

MODELLING

Models can be physical (hydrological), economic, or combined. Physical models are intended to capture the complexity of a water system, and are very data-intensive. Economic models aim to represent the balance of supply and demand in a system. If price and demand elasticity are introduced as variables, future scenarios can be generated that may be useful for policy and investment purposes. Another use of models is to optimize the distribution of water among different purposes, by generating its value in different uses.

Modelling is a useful way of throwing light on problems important to policy-makers, e.g., the sustainable yield of an aquifer, long-term supply-demand scenarios with water pricing, or optimizing the use of a reservoir serving different users (power, irrigation, flood control, amenity, fishing, etc.), but it is naïve to think that models can produce generally applicable policy solutions, since they are only as good as their underlying assumptions about laws, institutions and consumer behaviour. The same objections can be made to excessive reliance on integrated planning.

LEGAL AND INSTITUTIONAL REFORMS

Legal reform

In order to formulate a legal system appropriate to water management, a series of steps and actions is called for, as follows:

- collection of all legislation in force on, or related to, water resources development and management;
- analysis of such legislation and assessment for consistency with the policy options under consideration; detecting issues pertaining to established individual and communal rights and governmental powers; assessing the required adjustments in such rights and powers; and assessing the legislative drafting required to implement the new policy; and
- drafting, implementation and enforcement of required legislation.

It is first necessary to consider whether the proposed policy is consistent with existing legislation governing or regulating the use, development and conservation of water resources and other related natural resources (e.g., land, forests and fish) and the environment. If it is not, the next step is to consider what changes will be required, and at which hierarchical level of lawmaking (i.e., constitutional, Act of Legislature, ministerial regulation).

For instance, the proposed regulatory policy of water abstraction and use may require a modification of the rights to use water held by individual or corporate members of the public. This would entail decisions about the extent to which such rights would be subject to change, and what guarantees should be offered.

Policies may require modification or de-centralization of the powers or scope of authority of the governmental or paragovernmental bodies responsible for water resources management and development, or for related functions (i.e., public health preservation, environmental protection, management of lands and forests, or conservation of wildlife). The introduction of a water charging policy may require modification to legislation currently giving water a non-economic status, or a modification of the privileges enjoyed by given users' groups, such as farmers.

The policy review may imply new legislation – as opposed to amending legislation already in existence. Implications for substantive legislative drafting should be recognized, especially if privatization or the introduction of corporate status to water departments is foreseen. Mechanisms for assuring the public accountability or control of private and autonomous bodies can be legally complex.

If it is proposed to allow the transferability of water through marketing water rights, the key legal questions are whether water should be transferable separately from the land where it is used, and whether transfers would be free or controlled by the government. Box 6 summarizes key legal issues, and Box 7 lists legal prerequisites for irrigation.

Re-organizing the water sector

Water utility reforms would require suppliers to behave more like commercial undertakings. This will implies adoption of more active pricing, introduction of metering, tariff restructuring, improved cost-recovery, and greater self-financing. This will often entail managerial and organizational reforms. The drawing up of a contractual plan with the government has been employed in some cases.

Privatization is appropriate in some instances, though it can take many forms and full private ownership is an extreme – and rare – variant. The French model of concessions and lease contracts has influenced a number of developing countries, e.g., Côte d'Ivoire, Guinea, Malaysia, Morocco and Thailand. Regulated private companies also operate in Santiago de Chile and Guatemala City.

Participation: NGOs and water user associations

An increasing number of private sector groups, including water user associations and other NGOs, are taking over some public sector irrigation responsibilities. The inclusion of water users in irrigation planning, management and ownership is proving to be an effective method for increasing irrigation system efficiency in many cases. Studies throughout the world demonstrate that user participation in irrigation services improves access to information, reduces monitoring costs, establishes a sense of ownership of policy among farmers and increases transparency as well as accountability in decision making.

Water user associations are expected to increase in number and importance over the next decade as the stress on self-reliance increases. Already, governments are turning many aspects of public irrigation systems over to water user associations. Well-documented examples can be seen in Argentina, Colombia, Indonesia, Mexico, Nepal, the Philippines, Sri Lanka, and Tunisia. In Indonesia, for example, the government had transferred more than 400 irrigation systems, covering 34 000 ha, to water user associations by 1992. In the future,

BOX 6: CHECKLIST OF SELECTED LEGAL ISSUES AND ATTENDANT LEGISLATIVE REQUIREMENTS IN WATER POLICY REVIEW AND REFORM

1. Does the proposed policy comport with existing legislation governing and regulating the use, development and conservation of water resources and other related natural resources (e.g., land, forests and fish) and the environment? If not, what changes will be required, at which hierarchical level of lawmaking (i.e., constitutional, Act of Legislature, ministerial regulation)? In particular:

1.1 Does the proposed regulatory policy of water abstraction and use require a modification of the rights to use water held by individual or corporate members of the public? If so, to what extent and under what guarantees will such rights be made subject to change?

1.2 Does the proposed policy require a modification of the powers or scope of authority of the governmental or paragovernmental bodies responsible for water resources management and development, or for related functions (i.e., public health preservation, environmental protection, management of lands and forests, or conservation of wildlife)?

1.3 Does any proposed water charging policy require

- modification of legislation conferring a non-economic status upon water?
- modification of the privileges enjoyed by given users' groups, such as farmers?

2. Does the proposed policy require new legislation – as opposed to amending legislation already in existence – to support it and, if so, what will attendant substantive legislative drafting requirements be? In particular:

2.1 Does the proposed policy promote the privatization of water services and, if so, what legal mechanisms will need to be written into the required legislation to reconcile the profit motivation of privatized services with the interest of the general public in dependable, up-to-standard and affordable levels of services?

2.2 Does the proposed policy promote corporatizing public water resources management and development bodies and, if so, what legal mechanisms will need to be written into the required legislation to ensure public accountability of the new corporate entities?

2.3 Does the proposed policy promote the transferability of water through a market mechanism of water rights and, if so

- will water be transferable separately from the land where it is used? and
- will transfers be free or controlled by the government?

as farmer financing becomes more commonplace, user groups will become even more powerful.

NGOs can undertake a wide range of water-related functions, from developing projects for rural water supplies and minor irrigation to fostering water user associations for water management purposes. Some NGOs encourage farmers to try new technologies, for example the catchment protection and sprinkler irrigation techniques introduced by the Aga Khan Rural Support Programme in Gujarat, India.

Many NGOs stem from local initiatives and operate as independently funded and self-managed groups. These organizations bring fresh views, new ideas and participatory working methods to other areas of development policy and practice. Much of their success is attributed to their local knowledge as well as their interest in and experience of regional conditions. They have been particularity active in promoting the interests of poor and disadvantaged groups through articulate and forceful advocacy and service provision.

The local base of NGOs may allow them to reach vulnerable or remote groups which are exceptionally difficult to reach with conventionally conceived and managed public

BOX 7: LEGAL PREREQUISITES IN IRRIGATION MANAGEMENT

As pressures on water resources and public finances increase, legal and administrative systems need to respond to the new requirements. This process includes a number of legal and institutional issues.

Water rights security a reliable quantity and flow of water of suitable quality, and protection from pollution are basic requirements for irrigation development. The issue of legal security has been evolving from existing or potential water conflicts and is addressed through legal mechanisms for conflict resolution. Security of water rights is, however, also required for non-conflicting situations related to market transactions, such as the commercial transfer of water rights among users or when using water rights as collateral for bank credits. Water rights titles, through certain and clear legal instruments, are critical to prevent conflict and to stimulate market mechanisms for enhanced efficiency in water use.

Customary legal rules and practices need to be recognized in statutory law as they are significant, especially in the rural context, for regulating access to water and settlement of water conflicts. The traditional informal approaches are important, since formal resolution of conflicts through litigation in courts of law is often risky, expensive and inconsistent with local culture.

Water allocation to different users is normally effected through water licences, which should allow an adequate level of flexibility while preventing or minimizing water conflicts. When previously-licensed water is re-allocated to higher-valued uses (e.g., shifted from agricultural to industrial water uses), legal mechanisms that regulate re-allocation and define the compensation to displaced licence holders are required.

Transferability of water use rights is particularly important for irrigation so as to encourage investment in water-saving practices and permit alternative, higher-value uses of the saved water. However, to curb speculation in water rights, especially when water is scarce, irrigation water is commonly considered to be appurtenant to the irrigated land. Purely market driven transfer systems are rare, and actual practices, to be consistent with public policy objectives and water plans, are often limited to transfers under the direct control of government water administrations.

Establishment of security of land tenure and of ownership rights, with land reform and re-distribution in response to objectives of social justice, offer the opportunity to replace forms of tenure such as tenancy and sharecropping, which inhibit development and hinder the efficient and sustainable use of irrigated land. To support the transition from traditional to modern agriculture, legal mechanisms are required for a gradual transition from customary rights into modern and tradeable titles.

Cost recovery is often restricted by legal and institutional obstacles such as farmers' exemption to levies, charges and service fees, inadequate authority to collect and enforce the charges, and lack of budgetary and institutional mechanisms to keep collected revenues in the irrigation subsector. Within the same objective of retrenchment of government's responsibilities, proper legal authority and enabling institutions should be established to transfer government responsibility to the users. The extent of the transfer of physical irrigation works to the users or their retention by the government, and the terms and the conditions for their use, need to be regulated. Users' groups need to be legally established and to be tailored to the scope of the functions of the users' associations.

Control of water pollution from irrigation raises legal issues on how much legitimate property rights of cultivators can be restricted, in relation to land under cultivation and agricultural practices and whether and what kind of compensation should be given.

schemes. With their close local contacts and skills in group mobilization and cohesion, NGOs can provide the institutional leadership required to bring about socially acceptable solutions, and in some cases (e.g., the Philippines) serve as community organizations.

ECONOMIC MEASURES

Macro-micro links

Improving water resource management requires recognizing how the overall water sector is linked to the national economy. Equally important is understanding how alternative economic policy instruments influence water use across different economic sectors as well as among local, regional and national levels and among households, farms and firms. For too long, many water managers have failed to recognize the connection between macro-economic policies and their impact on, for example, technical areas such as irrigation.

Macro-economic policies and sectorial policies that are not aimed specifically at the water sector can have a strategic impact on resource allocation and aggregate demand in the economy. A country's overall development strategy and use of macro-economic policies – including fiscal, monetary and trade policies – directly and indirectly affect demand and investment in water-related activities. The most obvious example is government expenditures (fiscal policy) on irrigation, flood control or dams.

A less apparent example is trade and exchange rate policy aimed at promoting exports and earning more foreign exchange. For example, as a result of currency depreciation, exports of high-value, water-consuming crops may increase. If additional policy changes reduce export taxes, farmers are provided with an even greater incentive to invest in export crops as well as in the necessary irrigation.

National development strategies can directly influence water allocation and use in other ways. In the case of a food self-sufficiency strategy, the government may subsidize water-intensive inputs to encourage farmers to produce more rice. By providing financial incentives for rice producers, the government is influencing the demand for water and private irrigation investment through price policies.

Apart from the direct effects on water use resulting from such price policies, the increased demand for irrigation water also has inter-sectorial, intra-sectorial, distributional and environmental implications. The agricultural sector is provided with an economic advantage in access to water vis-à-vis the industrial sector (inter-sectorial); water used for rice gains an economic advantage over water used for other crops (intra-sectorial); rice producers with more land and access to water gain over those with less land and water (distributional); and increased pesticide and fertilizer use are likely to affect water quality (environmental).

Sectorial policies affect water use and allocation in non-agricultural sectors in a variety of ways. For example, in the western USA, 70 to 80 percent of the region's water yield results from snowmelt from the high-elevation forests, many of which are under public jurisdiction. Water yields are significantly affected by timber harvest policies on these lands. Rangeland management policies on lower elevations also alter vegetation conditions and thus affect the rate of evapotranspiration, in turn affecting streamflow and groundwater recharge. In such cases, it is important for downstream, city water managers to recognize, understand and become involved through policy measures in the decisions and incentives of other sectors such as livestock and forestry (see Box 1: Mountain development).

With the continuing importance of structural adjustment and stabilization programmes, many developing countries are implementing fundamental changes in macro-economic and sectorial polices. Typical adjustment programmes call for a greater reliance on markets, more open trade, fiscal austerity, a phasing out of producer and consumer subsidies (in input and product markets), and generally higher exposure leading to changed cropping policies. Budget-reducing measures imply increased competition among and within sectors for the funding for new water projects. In these situations, the overall economic, social and environmental implications of choices must be carefully addressed.

For example, when governments must choose between financing either irrigation projects or hydro-electric power projects, there is an additional social opportunity cost of the irrigation water in countries that are dependent on imported energy sources. At the same time, when water scarcity keeps some farmers on uneconomical lands such as steep catchments, the country suffers twice: once in terms of reduced production compared with what would be possible with irrigation; and again in terms of erosion and resource depletion, with erosion possibly shortening the life of existing waterworks.

In most countries, pressure has increased not only to modify investment allocations but also to recognize and accommodate new demands for water. The direct implications for water managers include fewer capital investments in new water projects, the elimination of irrigation subsidies, increased efforts to recover costs and more emphasis on demand management to improve the efficiency of existing supplies.

Creating incentives

The best intentioned and designed reforms in the water sector may be frustrated if key economic factors work against them. For example, the benefits of rational pricing of irrigation water may be negated by artificially high farm-support prices. Penalizing wasteful industrial water use by pricing and effluent charges will be nullified by high protection on the output of heavy industry or by 'soft' budget constraints enabling parastatals to pass on increased water charges and fines to their sponsoring ministries. Hence, in those countries where water is becoming the scarce factor of production, action in the water sector should be consistent with other key economic factors.

The permissive effects of enabling conditions may be sharpened by the creation of incentives for the more rational use of water. These may be positive or negative, market or non-market. Those considered below are: tariffs; pollution charges; water markets; and non-market inducements.

Although *water tariffs* are in widespread use in countries at all stages of development, they are usually seen as a means of cost recovery rather than a way of actively managing demand. The principles of economic tariff setting are well established and accepted, and are similar to those in use in the power sector. They can be summarized as setting prices according to Long Run Marginal Costs. This usually entails adjusting the structure of tariffs to include a fixed and variable element, with the latter rising for successive increments ('progressivity').

There is evidence of enough elasticity of demand in the household sector to make tariffs an effective instrument for water demand management. A consensus is emerging from a variety of empirical studies that the price elasticity of demand for water by households falls in the range -0.3 to -0.7, implying that a 10 percent increase in prices leads to a fall in demand of between 3 and 7 percent (Winpenny, 1994). A pre-condition of economic tariffs is metering, which is not always feasible or sensible.

BOX 8: ISSUES IN IRRIGATION PRICING IN DEVELOPING COUNTRIES

From a selective review of recent literature on irrigation water pricing in developing countries, it is evident that efficient market pricing of water is not taking place. There is wide diversity involved in the objectives, constraints and conditions, socio-economic, political and institutional setting and other physical and engineering aspects of irrigation development across countries, across regions within a country and even across projects within a region. Each irrigation project therefore needs to be managed differently to use irrigation water efficiently and to attain the different goals and objectives. This in turn means that there must also be a de-centralization of control so that irrigation managers can be efficient at the project level. Unfortunately, in most developing countries, there is too much centralization in the control and management of irrigation projects, which results in the use of uniform rules, regulations and policies concerning the provision and pricing of irrigation services that do not suit all projects equally. This state of affairs results in inefficient functioning of the irrigation system. So what is urgently needed to move faster toward an efficient market-oriented irrigation water allocation and pricing mechanism is the de-centralization of control so that decisions are taken at the project level. Even though this process would lead in the short run to non-uniform pricing of irrigation water across projects and regions, in the long run it would lead to a more efficient pricing structure across projects and regions and set in motion the competitive forces that will ultimately lead to optimal utilization of water resources. (Sampath, 1992: 975)

Setting economic charges for water may also be the best way of discouraging industrial water pollution, by penalizing excessive water intake. In an unpublished study by D. Gupta and R. Bhatia in 1991 of two private Indian fertilizer companies of a similar size, the one paying a high price for its municipal water achieved a unit water consumption per tonne of nutrient production only 40 percent of that in the other company, which depended partly on its own wells and partly on low-priced public supplies.

The application of *pollution charges* proportional to the volume and quality of effluent is more rare, but has been shown to be effective in reducing water intake as well as discharge. In three industries in São Paulo, Brazil, the introduction of an effluent charge led within two years to a 40 to 60 percent reduction in water consumption (quoted in Bhatia, Cestti and Winpenny, 1994).

In irrigated agriculture, the use of pricing to encourage efficient use of water is desirable in principle, though fraught with practical problems. Many governments subsidize water as an instrument of food policy. The subsidy to irrigation water becomes capitalized in the price farmers pay for their land. It is impractical to meter water supplied to large numbers of small farmers, who in any case receive a variable quality of service.

In practice, irrigation charges, where they are recovered at all, tend to be based on the area irrigated, the type of crop, the length of irrigation time, and other proxy measures. Although these methods should not be decried if they contribute to cost recovery - essential to provide funds for O&M (operation and maintenance) - they do not encourage efficient use of the water.

This explains the growing interest in 'devolved' solutions, such as measuring and pricing water delivered to an entire village or water users' association, and relying on the latter to recover costs from users and ensure the most efficient use of the water. Alternatively, groups of small farmers, or one large farmer who sells to others, can be metered.

The greater devolution of control over pricing and other key irrigation decisions would lead, in the short run at least, to greater variation in water prices among different projects and regions. But this may be a price worth paying if it leads to greater recognition of the value and opportunity cost of water, and improved cost recovery (Sampath, 1992).

The availability of *groundwater* is a complication in pricing surface irrigation water. If the latter is fixed too high, there will be an incentive for increased pumping from aquifers. Once this exceeds the aquifer's natural recharge rate, mining occurs, which can have external costs for society. Heavy pumping from one well may lower the aquifer for all other users of wells in the area. Apart from the short-term costs, the process may be irreversible if the water table becomes contaminated, or if land subsidence occurs.

For such reasons, the coordinated management of surface water and groundwater is vital, especially in areas such as south Asia, where groundwater supplies a large part of the irrigated area. An additional complication in managing groundwater is that the aquifer is a common property resource. In the absence of penalties, individual users have an incentive to overexploit the resource, since the costs fall on all users. By the same token, no one user has an incentive to abstain from use, since someone else would benefit from this abstinence.

The essential choices for managing groundwater are therefore some form of control by the community of users, or measures imposed by the state. Apart from informal agreements, which are only feasible in small homogeneous communities, the choice of measures is between:

- prices and charges (e.g., volumetric charges based on metering pumping rates, taxes and price adjustments for fuel or electricity);
- quantity-based controls (permits for new wells, taxes on pumps, specifications for pumps, pumping quotas); and
- transferable pumping entitlements (quotas that can be bought and sold within a group of users).

In view of the problems with monitoring and enforcement, quantity-based approaches may be superior to pumping charges, and can yield economically efficient solutions (FAO, 1993a).

The *conjunctive use* of surface water and groundwater should be part of any irrigation management scheme where the two sources are available. For instance, surface supplies might provide a regular base supply, topped up with groundwater to satisfy the peak demands of crops.

There are various types of *water markets*. Their common feature is that water can be bought and sold, thus enabling it to find its highest value use. Groundwater markets are long-established and widespread in certain parts of Asia, e.g., Gujarat in India, and in Bangladesh. Farmers sell water surplus to their requirements to those in deficit. Surface water markets exist in some western states of the USA and in eastern Australia, either to transfer water from low-value irrigated farming to urban consumers, or to redistribute water within agriculture. Sometimes the transfers are semi-permanent arrangements, e.g., the efforts of the Los Angeles Metropolitan Water Authority to acquire long-term water rights from its agricultural neighbours.

Water auctions, although unusual, are well-established in parts of Spain, and have been tried in Australia. *Water banking* has also been tried: as a response to the recent drought, the state of California bought up water rights from farmers to hold in reserve for urban and industrial use (and most of the stock was drawn down for these purposes).

Despite the value of economic instruments in improving the efficiency with which water is used, there will always be a role for *non-market devices,* often working in tandem with economic measures. Education and publicity campaigns can help create, among the public, awareness of the need for water conservation, though the message will be powerfully underlined by the use of tariffs. In water pollution, some contaminants are so dangerous that they should be banned - pollution charges are not enough. The only feasible response to short-term water supply emergencies may be to ration supplies and ban wasteful uses.

Certain societies have successfully used *prescriptive norms,* based on 'best practice' or reasonable usage in each case, reinforced by penal charges for users exceeding these norms. In Tianjin, China, norms are set for industrial consumers based on regular detailed water audits, and users who exceed their quotas pay a penal water charge of up to 50 percent above the normal level (Bhatia, Cestti and Winpenny, 1994). A similar approach has been used in Israeli agriculture.

PROJECTS AND SPENDING PROGRAMMES: PROJECTS VS POLICIES

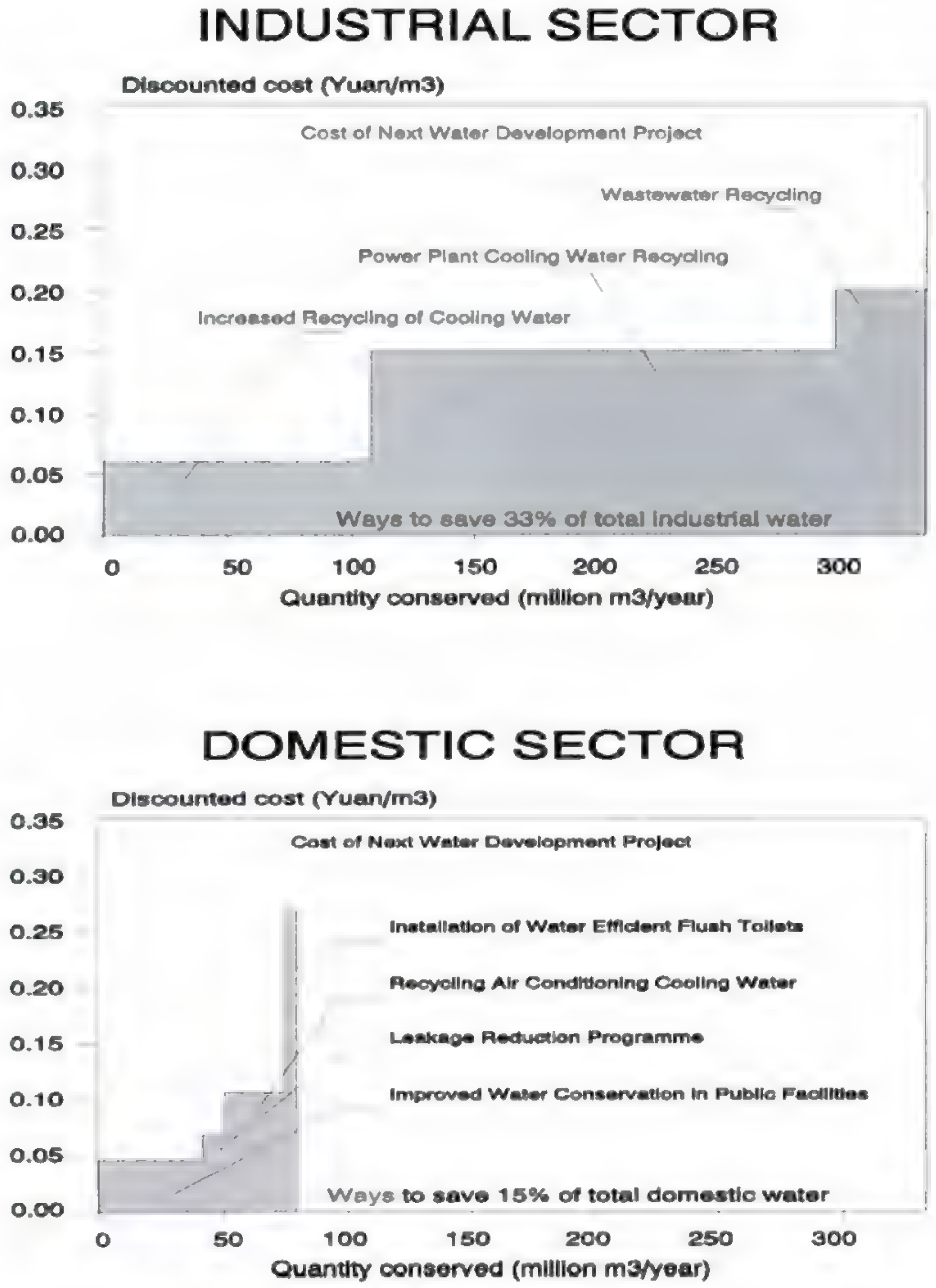
The process of water policy review is likely to culminate in drawing up, revising or implementing projects and programmes entailing public expenditure. It is therefore important that the structure of public capital budgets, the choice of projects, and the way they are designed and carried out, are consistent with the overall strategy. After some general remarks, this section discusses four processes that are particularly relevant in project choice and design: cost-benefit analysis, cost-effectiveness analysis, environmental assessment, and financial management.

The impact of the kind of reforms suggested in earlier chapters would be to produce an enabling environment in which better decisions about water were made. Some of these decisions would be made by private individuals, farmers and companies - e.g., in response to regulations, pricing, or the development of water markets. No further action would be required of the state.

Policy reforms may substitute for projects. In the event of an emerging water shortage in a sector or region, the government has the broad choice of introducing demand-management and conservation policies, or investing in new supply schemes. In this sense, projects may represent the 'easier' option, at least in so far as they are more popular with the public and avoid difficult changes in consumer behaviour. The national water strategy in England and Wales adopted the key policy that water resources development should not be demand led (NRA, 1994).

However, a new strategy will typically involve both policy reforms and projects and spending programmes. A number of non-conventional projects are likely to be considered, such as canal lining and leakage reduction measures, urban projects to reduce unaccounted-for-water, subsidies for the use of water-efficient consumer devices, mounting public information and advice campaigns, etc. Projects carried out in related sectors may also have a close bearing on water supply, e.g., catchment area and watershed management, afforestation, hill farming schemes, anti-erosion measures, flood-control devices, etc.

FIGURE 2
Supply curve for conserved water in Beijing (quantity conserved vs. discounted cost of conserved water) (Hufschmidt *et al.*, 1987)



Cost-benefit analysis

Cost-benefit analysis (CBA) has been widely used in the water sector since the 1930s to select projects and check their viability in a systematic way. In essence, the costs of a project (capital equipment, land, operating, maintenance, periodic replacement, etc.) are entered in each year in which they are incurred. Likewise for benefits, whether they are sales, cost savings, or non-marketed attributes (such as flood control) which are valued indirectly. Financial values of both costs and benefits are adjusted to reflect their underlying scarcity value, and the difference between the future streams of costs and benefits is discounted to obtain a present value.

In the context of water policy review, CBA practice needs to be modified and extended in several ways:

- By applying to both supply-augmenting and demand-management measures in a consistent way. Benefits of the latter include, for instance, savings in the cost of supply, while their costs comprise the forfeit of benefits from using water. This implies some measurement of water benefits.
- The efficiency criterion should be supplemented by the others discussed in Chapter 3, namely efficacy, equity, environmental, fiscal, acceptability, feasibility, and sustainability.
- Both costs and benefits should be extended to include economic measures of environmental impacts, following environmental impact assessment (see below).

Cost-effectiveness analysis

Cost-effectiveness analysis (CEA) is applicable where benefits cannot be adequately measured. CEA is also useful in comparing alternative, or cumulative, ways of attaining a given level of benefits. CEA can yield the discounted economic *costs of achieving a unit of conservation*.

Figure 2 illustrates the results of an exercise into cost-effective ways of meeting Beijing's future water requirements without major investments in new supply sources. It was discovered that one-third of industrial water consumption could be saved by adopting three measures: more recycling of industrial cooling water, recycling of power plant cooling water, and wastewater recycling. On a discounted basis, these measures were ranked in the above order. They were all substantially cheaper than the obvious next project to develop supply.

In the domestic sector, it was found that four techniques could save 15 percent of consumption, and each of them was cheaper than the alternative of augmenting supply. These were improving conservation in public facilities, programmes for the reduction of leakage, recycling air-conditioning cooling water, and installing water-efficient flush toilets. If the costs – appropriately discounted – and amount of water saved by these measures are arrayed as in the graphs in Figure 2, they form a 'supply curve' of conserved water.

Environmental assessment

The water sector is simultaneously a major perpetrator and victim of environmental change. The provision of water often entails drastic interference with natural hydrological systems (e.g., dams, reservoirs, river diversions, aquifer depletion), but, equally, water is polluted by the waste from other sectors, and irrigation and urban water supplies are vulnerable to upstream activities, and the deterioration of watershed slopes. Water is inextricable from the environment and the precondition of any important decision in this sector is an understanding firstly, of its own environmental effects, and secondly, of how environmental change triggered by other forces will affect this sector.

Many agencies have developed environmental assessment guidelines and procedures. Water poses particular difficulties in that it is a cross-cutting issue arising in a number of other sectors, hence no single checklist can suffice. In assessing how water will be affected by developments in other sectors, the relevant checklists and assessment guidance for those sectors should be consulted, such as in the World Bank's Sourcebook (World Bank, 1991), or the guidelines currently being prepared for publication by FAO (FAO, in press).

For decisions on water development *per se*, using a checklist such as that in Box 9 would alert the analyst to the main potential risks and issues. Where information on a potentially important topic is not available, this indicates the need to commission an *Environmental Impact Assessment* (EIA). Decision-makers should equip themselves with the facts about the type of environmental impacts at stake, their potential seriousness, how they could be mitigated and at what expense, and whether there are alternative ways of achieving the same objectives with less environmental risk.

Also, non-physical measures and implementation of new policies, such as structural adjustment and water sector reform may have significant impacts upon the environment. EIA of the implications of a particular policy element can provide an effective preventive tool if implemented at each stage of policy formulation in an reiterative procedure. Environmental assessment of policy could be a part of policy management monitoring, as discussed briefly in Chapter 5.

Financial management

The need for improved financial management in practically every water regime results from several converging factors: poor financial management and inadequate cost recovery have left most utilities decapitalized and underfunded; the cost of new supply schemes is growing in real terms; more stringent environmental standards are driving major investments in water quality improvement; and many old systems, such as sewers, are in urgent need of renewal.

These factors point to the importance of:

- cost control within organizations;
- improved pricing and charging systems;
- better collections from users and more stringent penalties;
- developing models for commercializing existing utilities; and
- looking at options for privatizing services.

This in turn requires attention, *inter alia*, to the following topics:

- Tariffs — incentives, fairness, simplicity and efficiency of collection.
- Proportion of income to come from charges.
- Powers to raise capital from various sources and by various means.
- Rules for investment of funds – issues such as balance between risk and yield.
- Accounting principles, standards and practices.
- Budgetary control principles and practices – e.g., cost centre and profit centre accounting.
- Value-for-money and other audits – principles and practices.

BOX 9: CHECKLIST FOR ENVIRONMENTAL IMPACT OF WATER DEVELOPMENT PROJECTS

IS THE PROJECT LIKELY TO:		Yes	No	Not known
1.	affect any natural feature, surface water hydrology, surface water quality, soils, erosion, geology, climate or water resource adjacent to the activity area?			
2.	affect wildlife or fisheries?			
3.	affect natural vegetation?			
4.	affect or eliminate land suitable for agricultural or timber production?			
5.	affect commercial fisheries or aquaculture resources or production?			
6.	affect the quality of water resources or catchment areas within or adjacent to the activity area through change in the water supply downstream of irrigation or through human or animal toxins?			
7.	affect air quality in the activity area or adjacent areas?			
8.	require relocating the existing population, community facilities, and housing?			
9.	lead to changes in the supply of, or demand for, infrastructural items?			
10.	cause substantial change in income and traditional source of livelihood of existing population?			
11.	include provisions to investigate the impact on regions where resettlement is occurring?			
12.	result in potential conflicts or affect physical, demographic or attitude/value cohesion?			
13.	affect archaeological sites or structures of historic or cultural significance?			
14.	induce or exacerbate erosion in the watershed area?			
15.	exacerbate water rights conflicts?			
16.	provoke a significant reduction in downstream flow, impairing aquatic life or endangering wetland water supply?			
17.	create or exacerbate insect disease hazards?			
18.	be designed without prior consultation or participation of affected populations?			
19.	provoke a shift in crop pattern in the region?			
20.	provoke a shift from low-input to high-input farming practices?			
21.	ignore provisions for post-project monitoring?			
22.	require long-term extension services?			
23.	be formulated outside the framework of a global strategy for development?			
24.	induce new migration towards the projects area (around reservoirs)?			
25.	be implemented in the absence of a training programme on techniques for more efficient water use?			
26.	create or exacerbate soil salinity problems?			
27.	be designed without adequate drainage facilities?			

Source: A guide to the environmental assessment of irrigation and drainage projects in developing countries (FAO, in press)

Chapter 5

Analytical structure and sequence for review

This chapter offers a structured approach to carrying out a water policy review, providing an organizing principle for material presented in earlier chapters.

Starting with an assessment of the importance of water in national social and economic life, it proceeds through a matrix of problems and critical issues, a quantification of pressures, identification of options, the formulation of an implementation strategy, and concludes with the action programme and implementation schedule.

Previous chapters contained material on likely problems, the general principles according to which they should be tackled, and some of the methods and techniques available. This chapter offers an *organizing principle* for carrying out the review, in six steps. These are listed in Box 10, and elaborated in the remainder of this chapter.

BOX 10: THE STRUCTURE OF WATER POLICY REVIEWS

1. Determine the importance of water in national social and economic life.
2. Prepare a matrix of problems and critical issues.
3. Quantify and rank pressures on the water resource.
4. Identify options for mitigation.
5. Formulate a water strategy.
6. Define an action programme and policy management monitoring plan

1. DETERMINE THE IMPORTANCE OF WATER

In order to demonstrate the importance of water issues to policy-makers, the general public and key interested parties, certain broad indicators should be identified as critieria for the relative importance of the water sector. These indicators would also serve to establish the case for resources needed for the sector, in competition with the claims of other sectors and other projects.

BOX 11: Matrix of Problems and Critical Issues

Problem type	Evidence	Source	Relative importance
Supply-demand imbalance	By sector and/or region. Future trend.	Growth in population, per caput demand, climatic change, over-use of groundwater, etc.	
Level and quality of service provision	Proportion of population now and in the future with no, or inadequate, provision of safe water, affordable irrigation supplies, sanitation and wastewater disposal facilities; consumption per head; reliability of supplies; etc.	Shortage of investment funds; excessively high standards for connections; rapid growth of informal urban settlements; poor maintenance; shortage of funds for proper water treatment.	
Inadequate water quality	Water quality indicators at key sites; incidence of water-related diseases; rising cost of treatment by water users; legal actions; etc.	Growth of polluting industries; spreading urbanization; lax legislation, enforcement and penalties; poor irrigation practices; rising national and international quality standards; etc.	
Costs of future provision	Unit costs of projected schemes for supply, rehabilitation, treatment, sewerage, compared to current and past levels; future costs relative to public investment/aid budget; cost of environmental mitigation.	Exhaustion of easy options in the face of growing demand; insufficient examination of alternatives; insufficient demand management; poor cost recovery; etc.	Use international or historical evidence. Future date when it is likely to become critical.
Inefficient use	In agriculture: performance measures such as system efficiency, agronomic norms, economic value of water; proportion of UFW in municipal systems; limited spread of water-efficient consumer devices; etc.	Absence of incentives to conserve water; poor system maintenance; low public awareness of water situation; outmoded and inefficient industrial plant; limited access to imported technology; etc.	
Growing conflicts among users	Co-existence of surpluses and deficits among regions/sectors; growing shortages in particular uses; competition for limited supplies, e.g., between farming and urban areas; growing environmental stress; litigation over water; civil unrest; development of water markets and transfers; rising price of marginal water supplies; international disputes; etc.	Growing imbalance of water supply and demand; absence of means to settle disputes amicably or efficiently (e.g., laws, consultation procedures, markets, prices); failures of planning and forecasting; etc.	

Useful general indicators include:

- size of water-intensive sectors in the national economy; agriculture, heavy industry, processing, water-based tourism and recreation, navigation, and other sectors sensitive to environmental quality, such as health care;
- significance of irrigated agriculture to national food security, GNP and exports;
- cost to the budget and public investment programme of providing and subsidizing water services. Proportion of foreign aid earmarked for the water sector;
- relative importance of water-related diseases in national health status, and estimates of their economic and financial costs;
- balance of payments implication of water sector, e.g., debt servicing of water projects, cost of importing food due to internal water deficit, national and local food security, etc.; and
- estimates of national economic costs of water pollution.

These indicators should both present the current situation, and take a forward look to some relevant future date, say 10 to 15 years ahead. This is especially important for countries:

- with rapid population growth and/or urbanization;
- where the balance among sectors is likely to change;
- where changes in housing patterns and consumer taste are foreseen;
- where there is a large backlog of service provision to be made up; or
- where large investments in new supply, quality improvements, rehabilitation of systems and suchlike are envisaged.

2. MATRIX OF PROBLEMS AND CRITICAL ISSUES

Drawing on the checklist of critical issues in Chapter 2, a matrix can be drawn up, containing in each case evidence of the problem, its source and relative importance. The last mentioned can be signified on a scale of 1 to 5, where 1 is relatively minor and quite easily managed, and 5 is very serious and can only be tackled with great difficulty and/or cost. Box 11 illustrates the type of information required and how it could be organized. The problems chosen here are not intended to be a complete or even representative list, since each country will have its own.

This information, especially judgements on the relative severity of the different problems, should be used to compile a short 'hit list' of problems, with their principal causes, ranked in order of importance.

3. QUANTIFYING PRESSURE ON WATER RESOURCES

Evidence assembled in the form of the matrix in Box 11 would be extracted to produce orders of magnitude of the severity of the water problems, now and at crucial dates in a relevant planning period (between 10 and 25 years in the future). These data would indicate to planners and decision-makers the seriousness of the water situation, from various points of view, now, and how it might be expected to evolve in future.

TABLE 2
Key indicators for the water sector

Physical and hydrological	Economic and financial	Environmental
Balance between per caput availability and use of water. Level (depth) of groundwater in key aquifers.	Size of water-intensive or water-reliant sectors within the economy. Reliance of agriculture and food production on irrigation. Price of water in free-market conditions (e.g., from urban vendors or in auctions). Proportion of the national budget absorbed by water (e.g., operational deficits, overt subsidies). Proportion of public investment programme, foreign aid, or both, accounted for by water investments.	Water quality indicators in critical locations. Environmental costs of water provision and use (e.g., of dams, water pollution). Incidence of water-related diseases, and estimates of their cost to victims and for public health services.

This information could be organized under three headings: physical and hydrological; economic and financial; and environmental. Some of the *key indicators* are reproduced in Table 2.

4. IDENTIFY OPTIONS

Having identified the main problems and formed a judgement on their relative seriousness, the next step is to review options available for addressing the most important of them. The policy analysis matrix (Box 4) may be useful for categorizing actions. This matrix envisages actions at four main levels:

- *Planning and analysis*, entailing the creation of data systems and analytical frameworks, which may include strategy documents, water resource assessments, data banks, monitoring systems, modelling and research.
- *Legal and institutional reforms*, including the formation of management structures and regulations. These actions may include the reform of water and land legislation, agreeing water quality standards and passing supporting legislation, the creation of new authorities or systems of coordination, corporatizing or privatizing water utilities, empowering water user groups, setting up a regulatory framework for the private sector, etc.
- *Economic policies*, with the aim of providing a suitable enabling environment for water use. General economic policies should be examined to adjust their effects on water (e.g., farm support, food self-sufficiency, industrial promotion, new settlement). Specific incentives should be created to persuade users to treat water as the scarce resource it is, such as economic pricing, the creation of opportunities for markets and trading, and introducing pollution charges.

- *Projects and programmes*, such as public investments, information and education campaigns, and programmes to encourage water efficiency.

The choice from this 'menu' of actions should be subjected to the set of criteria set out in Chapter 3, namely:

- efficacy;
- efficiency;
- distributional impact;
- environmental impact;
- fiscal effects;
- political and public acceptability;
- sustainability; and
- administrative feasibility.

5. FORMULATE WATER STRATEGY

The following are some of the strategic choices to be made:

- *Inter-sectorial priorities:* where a growing supply-demand imbalance is foreseen, and conflicts between water users are likely to increase, decisions will need to be taken about the relative claims of agriculture, industry, urban use, recreation, the environment, etc.
- *Self-sufficiency in food:* this may need to be evaluated for its long-term implications for water.
- *Long-term international interests:* a country's water scenario may carry trans-frontier or global implications.
- *Mode of management:* between centralized and de-centralized, on the one hand, and public and private provision, on the other. In turn, there are various options for admitting the private sector. There is a further choice between authoritarian and participatory institutions.
- *Supply-oriented and demand-management measures:* within the latter, there is a further balance to be struck between command-and-control devices and economic incentives.

6. DEFINE ACTION PROGRAMME AND POLICY MANAGEMENT AND MONITORING PLAN

This final step should be taken once it is clear from the above what the strategy is, what needs to be done, what the mixture of policies should be, and what the priorities are. The strategy then provides an outline plan for the implementation of policy at successive levels of administration. It is difficult to be prescriptive about the precise modalities of a review, which will be very country-specific. The following chapter indicates how some countries have recently approached water policy reviews, and their general outcomes.

However, water policies are projected over longer periods, have normally a wide impact which is difficult to measure, and may not be implemented as proposed but respond to current needs and priorities. It might not always be possible to assess the repercussions beforehand and policy execution may require continuous monitoring for progress, re-evaluation and at times a revision of priorities that meet obstacles.

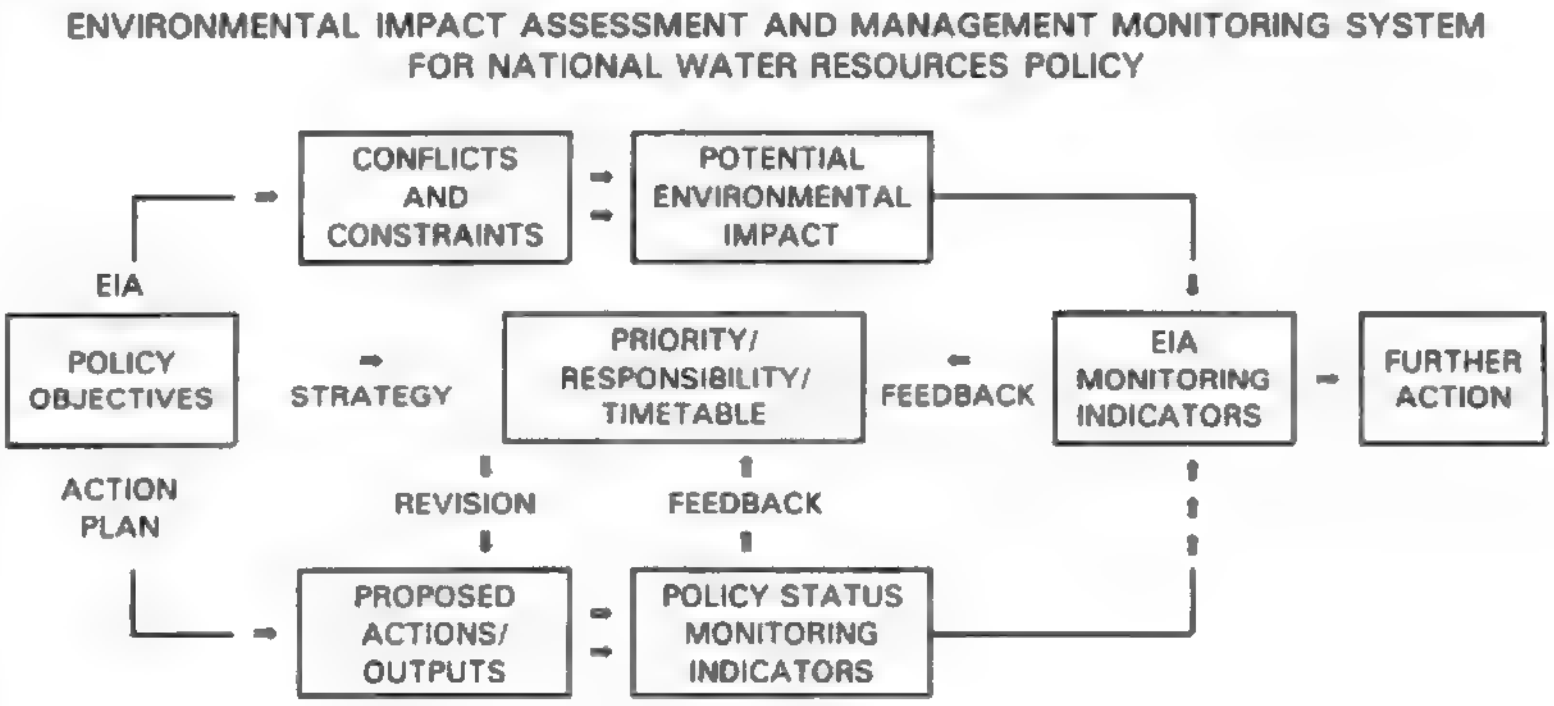
Policy management would benefit from monitoring policy actions, with cross-references among objectives, operational considerations such as priorities, time frames, responsible level and agency. The policy monitoring plan is therefore conveying and articulating the adopted strategy, and also including EIA indicators, as constraints and conflicts in implementation are the likely sources of environmental impacts.

To facilitate positive acceptance of policy, a preventive rather than a *post facto* mitigating approach is recommended. The focus needs to be on potential sources of conflict in order to assist in understanding, anticipation and early correction of problems, rather than a focus on assigning government's political and financial responsibility to solve and mitigate. Unintended negative effects may arise from the interaction of water policy with other national policies at cross-purposes. Enunciated water sector policy objectives and policy actions result from the political negotiations needed to reconcile competing policy needs.

Direct water policy actions may also be potential sources of adverse effects. This is a more likely development if isolated policy actions rely on imported concepts that are not tested locally or where the actions are based on increased government intervention in traditional areas.

The interaction between a policy monitoring plan and EIA is shown in the Figure 3 below, based on Feld (1994).

FIGURE 3
Diagrammatic interaction between a policy monitoring plan and EIA


ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT MONITORING SYSTEM FOR NATIONAL WATER RESOURCES POLICY
CONFLICTS AND CONSTRAINTS
POTENTIAL ENVIRONMENTAL IMPACT
EIA
POLICY OBJECTIVES
STRATEGY
PRIORITY/ RESPONSIBILITY/ TIMETABLE
FEEDBACK
EIA MONITORING INDICATORS
FURTHER ACTION
ACTION PLAN
REVISION
FEEDBACK
PROPOSED ACTIONS/ OUTPUTS
POLICY STATUS MONITORING INDICATORS

Chapter 6

Water policy reviews in practice

This chapter illustrates the nature of water policy reviews, drawing on actual cases in Yemen, France, Mexico, England and Wales (United Kingdom), Victoria (Australia), Chile, Indonesia, Belize, Turkey and Lithuania.

Particular attention is paid to the process of review itself, and how public consultation was organized. The outcomes of reviews are discussed under the headings of reforms in water rights, privatization and corporatization, the promotion of prices and market mechanisms, and reforms in planning and management.

The intention of this chapter is not to offer prescriptive guidance on how to mount water policy reviews, but rather to give readers the flavour of a number of such reviews that have actually been carried out.

It is only realistic to recognize that every country will wish to conduct reviews in their own way, responding to national differences in basic problems, cultural, legal, historical, political and institutional peculiarities, stages of development, professional and administrative capacity, and other fundamental factors. Hence this Guide does not prescribe blueprints.

WATER POLICY REVIEWS IN PRACTICE: COUNTRY EXPERIENCES

Table 3 contains examples of water policy reviews conducted recently by seven countries at various stages of development. Some issues of common interest are discussed below under the headings of review processes and main outcomes.

Review processes

A common problem in approaching the review is that the water sector is large and diverse, and responsibility for it is fragmented, or at least divided amongst several agencies. Hence one of the first decisions to be taken is how the necessary coordination of information and views should occur. Despite having a Central Water Council, *Yemen* found it expedient to appoint an interdisciplinary task force reporting to an Advisory Committee chaired by the Vice Minister responsible for Water Resources. The Advisory Committee contained senior officials at Deputy Minister level from all water-related ministries (Box 12).

In *Indonesia* the review was organized as a major multidisciplinary study by the Directorate General of Water Resources Development. It was supported by national and international expertise in water management, economics, legislation and institutions (Appendix 1). Likewise, in *Chile* the review process started with a technical study carried out by the Water Department of the Ministry of Public Works. In *Mexico*, a National Water Commission was created in 1989, with decision making powers over the allocation of water. The Commission steered through the important 1992 legislation. In *France*, a National Water

TABLE 3
Examples of water sector policy review

COUNTRY	WATER POLICY REVIEW: STEPS TAKEN				
	1. Justification for review	2. Initiatives taken	3. Draft policy document/public consultation	4. Main thrust of policy review/reform	5. Final documents and action
England and Wales (United Kingdom)	1985: Conflicting issues of financial management of public Water Authorities.	1986: Government white paper on privatization of water industry; then various reports prepared.	Release of consultation policy papers for Parliamentary review.	Redraw boundary between the public and an integrated private sector. Control of a privatized water industry.	1988: Water Bill released. July 1989: Water Act enacted by Parliament.
France	Supply-demand imbalance worsened by drought.	Creation of National Water Committee. Regional seminars. National Water Seminar (March 1991).	Discussion of policy proposals at National Water Seminar.	Manage water resources in an integrated and balanced manner Balance water resources development/conservation.	Law on Waters enacted by Parliament in January 1992.
Chile	Critical level of water resources deficiency; conflicts between the administration and the private sector on socio-economic and property issues.	1990: Government initiates review of water policy. August 1991: National Seminar.	Discussion of policy proposals at National Seminar.	Balance public and private sectors' roles; enhance tenure security of water rights.	Draft water resources legislation tabled in Congress (1992).
Mexico	Growing regional imbalance between water demand and availability of water to cities and to irrigation.	1989: Creation of the National Water Commission. Review of water policies.	Document outlining Water Policies and Strategies released and disseminated by National Water Commission (Dec. 1990).	Promote water use efficiency; improve quality of water services through enhanced role of the private sector.	Law on National Waters enacted by Federal Congress in November 1992.
Victoria (Australia)	Public impatience with a bureaucracy out of control and spending of public money without proper supervision.	1980: Public Bodies Review Committee set up to advise on policy. 1988: Independent Committee of Review set up to scrutinize proposed new water legislation.	1981: Committee recommendations released. 1986: Discussion Paper and Issues Papers for new legislation released. Workshops, public meetings held.	Rationalization of water management bodies. Restructuring of central water administration. Legislative reorganization. Corporatization of public sector agencies.	Water (Central Management Restructuring) Act enacted in 1984. Water Act enacted in December 1989.
Yemen	Over-exploitation, low-efficiency use and fast degradation of groundwater resources; institutional fragmentation resulting in conflicting draft water legislation.	1992: Government's comprehensive water resources policy review under inter-ministerial Advisory Committee and National Task Force.	Inter-sectoral and inter regional working groups.	Conservation and sustainable utilization of water resources; environmental protection.	Task Force's comprehensive report and policy studies; national seminar on water policy; a National Water Seminar in 1993.
Indonesia	Re-orientation of large public investment, with high water subsidy, deterioration of water resources infrastructure, regional supply-demand imbalance, water use changes.	1987: Irrigation sector policy. 1991: Government's comprehensive water policy review; creation of private sector organizations for water resources management.	National and international seminars on water management policy. 1994: Draft water policy and policy action plan for 2nd 25-Year Plan.	De-centralized water administration based on river basins; privatization and cost-recovery; cross-sectorial analysis; regional water resources development.	Water policy in 2nd 25-Year Plan and VIth Development Plan. De-centralized water administration.

BOX 12: THE REVIEW PROCESS IN YEMEN

In response to increasing fragmentation and largely uncontrolled or private-user-based water resources management, the Government of the former Yemen Arab Republic had established a Central Water Council under the auspices of the Ministry of Water and Electricity. It had, however, become increasingly clear that water management in Yemen, working in a policy vacuum and without regulatory systems, was not sustainable, leading to fast depletion and degradation of the resources, with increasing incidence of water conflict. *Ad hoc* drilling and non-sustainable abstraction of groundwater at increasing depth tended to lead to increased water cost and uneconomical uses. As a consequence of water users maximizing their income by appropriating other people's resources and shifting their own costs onto society, the groundwater resources were being depleted, resulting in decreases in food production. Scarce water resources were also being used inefficiently and well-functioning customary and tribal systems were replaced by inefficient bureaucracies.

Policy intervention was therefore necessary to unify the water sector and bring competitive economic forces into play to protect the resources. However, policy implementation would be limited due to insufficient and poor institutional framework and human resources, absence of inter-sectorial coordination, and lack of analytical tools, adequate and reliable data, effective policy instruments, mechanisms for R&D and adaption of new technologies.

Following unification in May 1990, the Government had not been able to agree on a basic water policy and institutional frameworks, including a basic water law, and in 1991, faced with two contradictory proposals for water legislation, the Government assigned the minister responsible for water resources the task of developing a coherent water policy as the basis for consensus on legislation and institutional frameworks for water resources management. An issue-and objective-based water policy was developed following a double track approach.

A national interdisciplinary water policy task force was set up with representatives from the various water subsectors. The task force developed draft water policy, reporting continuously to an Advisory Committee. The Advisory Committee was chaired by the Vice Minister, and had as members senior officials at Deputy Minister level from all water-related ministries. In this manner, a comprehensive draft National Water Resources Policy Document, including proposals for institutional arrangements for water resources management, was prepared for final review in a National Seminar, and consideration and approval by the Council of Ministers. The policy, when approved, will form the basis for a national water legislation and administration, and strategies and programmes in the water sector.

Committee, a consultative body comprising representatives of Government, water users and elected officials, took part in the final stages of the process leading to the 1992 Water Act.

Sooner or later in democratic regimes a public discussion paper on water policy will need to be released. Its purpose will be to inform the general public and interested parties of the problems and issues, indicate the main lines of proposed policy reforms, and invite comment and consultation. In the *United Kingdom*, where the water sector was privatized in England and Wales, the ground was prepared by the release of several official documents, starting with a White Paper and two consultation documents in 1986, a proposal for the National Rivers Authority in 1987, and a further White Paper in 1987, reflecting the reactions to the earlier one.

Chile also distributed a basic document on national water policy to agencies and departments involved in water resources management. After receiving comments, a version of this was considered at a national seminar in 1991, involving officials, academics, professional associations and water users. *Yemen* also used the device of a National Seminar for final review of the draft National Water Resources Policy document. Likewise, in

BOX 13: THE WATER REVIEW PROCESS IN VICTORIA, AUSTRALIA

The process of developing the new Water Bill in the period 1985-89 had the following elements:

- ***A Discussion Paper***, identifying principles and options. The review began in earnest early in 1985, in response to perceived deficiencies identified by stakeholders over the years. Various options for developing a modern legislative framework were canvassed in a Discussion Paper, released in September 1986.
- ***Issues Papers***. Over the following few months, six Issues Papers were released, each floating more intricate or innovative proposals in greater detail. One explained, in simple terms, the historical development of common law and statutory provisions concerning private rights in water, demonstrated existing anachronisms and explained how they could be solved. Another set out the principles of a system of transferable water rights, how such a system might operate and what benefits might be expected.

  Proposals for rationalizing the powers of different types of Water Boards were similarly explained. Other papers dealt with dam safety, drainage issues, groundwater and proposed procedures for objecting to, or appealing against, administrative decisions. In each case, the papers were widely distributed and written submissions and comments solicited.
- ***Public Consultation***. There were several distinct avenues of consultation. First, the Rural Water Commission, with assistance from the Victoria Farmers' Federation, held intensive, small group workshops with irrigators at 22 different locations, to discuss a possible system of transferable water entitlements. The various Water Boards were assisted by two teams to help them understand proposals, and to develop operational plans for Ministerial approval. Finally, early in 1987, 17 public meetings were held in different parts of the State to discuss issues known to be of particular local concern, to answer questions raised by the audience, and to invite further written submissions.
- ***Feedback***. Issues raised at each of the irrigators' workshops and public meetings were reported back in a series of Consultation Newsletters. Further written submissions were solicited. More than 150 submissions resulted from the irrigators' workshops and hundreds more from public meetings.
- ***Draft Proposals***. After consideration of the results of consultation, Draft Proposals for a Bill were prepared and released in July 1988. This document was widely circulated, with a call for further comment and submissions.
- ***The Independent Committee of Review***. In a novel move, designed to improve political support for the Bill, the Minister appointed an independent committee to review the Bill and take into consideration all comments and submissions made.

  The Committee comprised nominees of the Australian Conservation Foundation, the Water Authorities Association of Victoria, the Victorian Farmers' Federation, the Institute of Water Administration, the Association of Victorian River Management Authorities and the Australian Water and Waste Water Association. A further appointee was a retired member of the Victorian Soil Conservation Authority and a grazier. The Deputy Chair was a country solicitor, with a practice in water matters, and it was Chaired by a Government member of Parliament who had formerly been a farmer and an irrigator.

  The Committee distributed almost 3 000 copies of the draft Bill and advertised widely for submissions, receiving almost 150, half of which came from water or sewerage authorities or their representative organizations. The Committee considered matters of principle and issues of major concern in the submissions made. In the five months available to it, it was unable to deal with all matters of detail raised in submissions, although each submission was considered. Time constraints prevented the Committee from holding its own public meetings.

  Its report of 63 pages made 127 generic recommendations on matters which it referred to the Department of Water Resources for further consideration. Each of these matters was examined in drafting the final Bill, which was considered by Parliament in the Spring Session of 1989.

BOX 14: WATER POLICY REVIEW IN BELIZE

The water sector review was initiated in a national meeting and furthered by the establishment of an inter-ministerial *Pro-Tempore* Water Commission, with a mandate to prepare draft national water resources policy and provide recommendations for institutional and legal arrangements. The outcomes were a draft statement of national water resources policy, proposed institutional arrangements, and a draft national water resources legislation.

The policy review confirmed the need for a strong commitment from all parties in Belize to develop further and to implement a water resources management policy. It was necessary to centralize the normative and regulatory functions for water resources, and bring them together with the water resources assessment and planning responsibilities under one body – a move which required strong political support and adequate sustainable institutional arrangements, including the approval and enactment of a central water act. Other priority activities arising from the policies were improved information management, establishment of a water licensing system and encouragement of efficient water use, as well as transfer of financial responsibilities to the water users.

The institutional priorities included a development in stages with successive transfer of responsibilities for water resources management, monitoring and control to a National Water Commission supported by an executive Water Resources Department. In future, the administrative costs for water resources management should be reduced by more efficient use of existing human resources at government level and cost recovery from the water users.

France, a series of seminars were conducted in the various regions, open to all potentially interested parties, especially farmers and local officials. The results of these seminars were considered at a national water seminar (Assises nationales de l'eau) in 1991.

An elaborate public consultation procedure was held in *Victoria* (Box 13), consisting of a Discussion Paper, Issues Papers, other detailed papers, group workshops, explanatory missions, public meetings, etc. An Independent Committee of Review was appointed, which distributed a large number of copies of the draft Bill and received evidence from many interested parties.

In all the above cases, the careful preparation of the ground for reforms by issuing public documents and eliciting comments by interested parties paid off in easing the eventual passage of legislation or policy measures.

More recent examples of the process of review of water policies include Belize, Lithuania. In *Belize*, the priority water issues were declining water quality and fragmentation of water resources management, and the approach used to deal with the problem is considered in Box 14.

Lithuania, an Eastern European country in transition, was in the process of reforming its water and land resources legislations, and this prompted a review of water policy. The review aimed at providing an accepted policy base for the new national water legislation, and the review process raised many issues related to water quality control, changing agricultural practices and land-use policy, with immediate implications for de-centralization of water administrations and privatization of water works. Examples of different aspects to be considered in the policy are given in Table 4.

Review outcomes

The main outcomes of the reviews conducted in the countries listed in Table 3 can be considered under four main headings: reforms in water rights; privatization and

TABLE 4
Factors addressed in the water policy review process in Lithuania

ISSUE	ACTION NEEDED	LEGISLATION
1. Unsafe groundwater supplies in rural areas.	1. Regulated use; closure of unsafe supplies; incentives for improved individual and shared groundwater supplies; sale and distribution of potable water by private vendors.	1. (a) Regulate, through new water legislation, the use of groundwater for drinking and household purposes; (b) empower the public administration to close unsafe groundwater wells and enforce this measure.
2. Need for identification and definitions of water protection areas.	2. Introduce water quality and quantity control systems.	2. Enforce existing legislation on protected areas.
3. Waste from pig complexes is discharged directly into watercourses; lack of appropriate technology for handling of waste from pig complexes.	3. Incentives for installation of adequate waste treatment, dewatering and deposit systems; proper use in agriculture. Regulation: closure of complexes which cannot comply; plan restructuring of livestock subsector.	3. (a) Consolidate, in new water legislation, provisions on financial incentives for wastewater treatment; (b) empower public administrations to take emergency measures in cases of serious water pollution; (c) introduce a code of good agricultural practices.
4. Conflicts between (a) intensive agriculture, and (b) water quality protection from agrochemical pollution.	4. Basic policy decision reflected in land-use planning policy.	
5. Groundwater pollution from municipal wastewater in Karst areas.	5. Incentives, e.g., favourable credits to municipalities following priorities based on basin plans.	
6. Policy issues related to the use of surface water are linked with pollution and dilution requirements during periods of low flows, e.g., the Neverzies river.	6. Basin-specific policy as regional development policy: e.g., individual basins to cover water costs or cross-subsidies between inter-linked basins at national level.	
7. Conflict between (a) licensing and (b) quality control of pesticides, carried out by the same agency.	7. Pesticide quality control by the ministry responsible for trade based on environmental standards.	
8. Financing and implementation of municipal wastewater treatment to EC-HELCOM recommended standards.	8. Recognize real economic constraints; investments consistent with aims for domestic sanitation and environmental protection and cost to the economy; focus on pollution prevention vs. end-of-pipe treatment.	
9. Collection and treatment of industrial urban rainwater runoff.	9. As for 8.	
10. Poorly managed solid-waste dumping sites.	10. Define priorities for improvement/clean-up of solid-waste dumping sites based on a national plan.	
11. Consideration of step-wise, time-programmed implementation of industrial effluent standards.	11. Allow lower intermediate standards and grace periods based on restructuring plans for industrial subsectors.	11. Provide, through new water legislation, for phased implementation of effluent standards.
12. Need to consider economic and social consequences of effluent standards and water quality objectives.	12. Time frame for implementation of standards related to actual economic progress and affordability at national, sectoral and individual entity level.	12. As for 11.
13. Industry to have access to clean technology for safe disposal of waste.	13. Incentives for technical and research partnerships on a commercial basis for clean technology.	13. As for 3 (a).
14. Inefficiency and operational problems of joint industrial and municipal wastewater treatment.	14. Enforcement of standards for discharges into municipal treatment plants and main sewers.	14. Punish, by new water legislation, non-compliance with wastewater discharge permit conditions.
15. Viability of irrigation dubious; alternatives needed for disposal of slurry waste from pig complexes.	15. As for 3.	15. As for 3.

corporatization; the promotion of prices and market mechanisms; and planning and management reforms.

Reforms in water rights

In *France* and *Victoria, Australia,* reforms amounted to replacing systems of water abstraction and use based on rules of custom – most notably, riparianism – administered by the courts through litigation among water users, by systems based on government-administered permits. *Chile,* in contrast, is considering tightening up a loose system of government-administered permits.

Broadly, in *France* and *Victoria, Australia,* the first two countries, riparian proprietors were free to abstract and use water from a stream or from under their land. The option of switching to a radically different system requiring a government permit for water abstraction and use had implications for the legitimate water rights held by riparians, who stood to suffer a loss of property rights through no fault of their own.

The legal implications of the changes were (a) the need for radically revision of the existing law governing water abstraction and use, particularly by riparian proprietors, and (b) decision as to whether riparians should be compensated for the loss they would suffer in their legitimate property rights. The same issues arose in *Chile,* where reforms were considered to an exceedingly generous water rights system which conferred unrestrained powers akin to ownership over the waters covered by the grant. Owners of such rights may feel entitled to some form of compensation for the loss they stand to suffer.

This issue was dealt with differently in the various states. In *Victoria,* riparian landowners were substantially 'compensated' through the new legislation acknowledging their continued right to abstract and use water without a government permit for certain limited uses only. In *France,* the rights of riparian landowners to abstract and use water were unaffected by the new law but, at the same time, they became subject to registration with the government for further administrative disposition under either a simple declaration regime or a more restrictive permit regime. *Chile* seems to have taken the approach of leaving unaffected all rights which have accrued under the existing legislation.

Privatization and corporatization

This was a major theme of the reforms in *England and Wales (United Kingdom), Victoria (Australia)* and *Mexico.* In all three countries, water supply, sewerage and sewage disposal services used to be a public-sector responsibility, and in Mexico likewise for the provision of irrigation water supply services. For both efficiency and public revenue motives, all three countries chose to privatize or corporatize their water services.

Different solutions were adopted for the problem of regulating prices in a monopoly or near-monopoly situation. In *England and Wales* (Box 15) tight statutory requirements have been placed on the newly formed private companies, particularly in regard to the quality of service and charges. The power of the service companies to fix charges has been made conditional on the prior governmental approval of company proposals – the so-called Charges Scheme. The powers and obligations of service companies are further spelled out in the terms of their operating licence.

The task of supervising the standards and levels of service, the maintenance of the water infrastructure and the levels and amounts of the charges of the water service companies is entrusted to the Director General of the Office of Water Services – a non-ministerial government department. The Secretary of State or the Director General of Water Services

BOX 15: WATER POLICY REVIEW IN ENGLAND AND WALES (UNITED KINGDOM)

In the United Kingdom, the policy of privatization of the water industry in England and Wales took shape as follows:

- February 1985: debate in the House of Commons on the Water Authorities (Return of Assets) Order. The Government tried to get Thames Water Authority to make accelerated repayment of a loan, which would have caused a 10% increase in water charges. The Authority informed the Government that it would repay the loan only after having received the approval by a Motion of the House of Commons, which in the event the Government won with a narrow majority. This spurred the Government's interest in privatizing the water industry.
- February 1986: publication of a Government White Paper on *Privatization of the Water Industry in England and Wales*. In this paper, the Government announced its proposal to transfer the ten Regional Water Authorities into the private sector without any change of functions, thereby preserving the concept of integrated water resources management.
- March-April 1986: the Government releases two consultation papers on, respectively, water and sewerage law, and the water environment. The decision to form a separate body for water pollution control and water resources management was first announced in April 1987.
- The House of Commons Select Committee on the Environment present a report on the existing water pollution control arrangements. The environmental lobby and the Confederation of British Industry advocate transferring the regulatory functions of the Water Authorities to a public independent body.
- June 1987: general elections, won by the Conservative Party.
- July 1987: the Government publishes a proposal for a public regulatory body in a privatized water industry, namely the National Rivers Authority.
- October 1987: Second Reading, in the House of Commons, of the Public Utilities Transfers and Water Charges Bill. This Bill (then passed in 1988) authorized the Water Authorities to reorganize themselves internally into utility and regulatory divisions.
- December 1987: publication of *The Government Policy for a public regulatory body in a privatized water industry*. The paper reflected the criticisms of some of the proposals in the 1986 White Paper, and laid out the structure of divided regulatory and water service responsibilities, which was incorporated in the Water Bill.
- 24 November 1988: the Water Bill is released.
- 6 July 1989: the Bill is enacted into law as the Water Act 1989.
- 25 July 1991: review and consolidation of water resources management under the Water Resources Act 1991, repealing the water resources management elements of the 1989 Act.

have been given powers by the Water Act 1989 to make provisional or final enforcement orders against water service companies.

In *Victoria*, the Melbourne and Metropolitan Board of Works and the Rural Water Commission were corporatized through separate Acts of Parliament passed in July 1992. The Commission has been turned into a Corporation and its Board of Management restructured to include commercial, legal, financial and water management expertise. Public control of its operations is achieved through rolling three-year performance contracts, to be negotiated between the Corporation and the Minister responsible for water. Regional Management Boards will also be established, with delegated powers and similar operating modes.

The Rural Water Corporation will act as a 'holding corporation' and be responsible for maintaining State-wide hydrological services. Two subsidiary service corporations will be set up for technical, financial and administrative support to Regional Management Boards.

In *Mexico,* the new Federal Water Act confers on irrigation water users' groupings the legal status and powers needed for them effectively to manage the irrigation systems, which are scheduled for transfer from the Government to the private sector. The service customers sit on the Boards of Management of the public irrigation companies. At the state level, legislation has been enacted to strengthen the financial and managerial flexibility of the urban water and sewerage utilities by turning them into commercial companies with authority to fix and collect service charges and to cut off service for non-payment of charges due. The managing boards of these companies contain, amongst others, customers' representatives, in an attempt to ensure some accountability.

In *Turkey,* initial emphasis was on mobilization of the private sector for hydropower, which was supported in Law 3096, 1984. Two projects including hydropower components have been completed, based on Build, Operate and Turnover (BOT) financing arrangements, and several others are under project preparation and negotiation. The BOT financing model was later approved, in Law 3996, 1994, for urban water supply projects. Major domestic and industrial water supply projects have been planned and tendered for BOT execution.

Transfer of O&M responsibilities in government irrigation schemes to water users' organizations, as associations, municipalities, village bodies and cooperatives, was provided for already in 1954 in the establishing law for State Hydraulic Works. The transfer programme was accelerated from 1993. The review process is summarized in Box 16.

Promotion of prices and market mechanisms

One attendant legal issue is the legal status of water vis-à-vis the land it 'serves,' i.e., whether water rights should be tied to ownership or possession of the land and to a particular use, or should have independent status. Another is reconciling the uniquely distinctive 'public good' connotation of the 'commodity' water with the profit motivation of market-driven water-rights holders' allocation decisions.

In *Victoria (Australia),* restricted water markets were allowed to develop in the irrigation sector alone, and within the same irrigation district or among different irrigation districts. Transfers are subject to prior screening and approval by the irrigation district authorities, who may impose restrictions on such matters as: the minimum amount of water rights that must be retained by any landowner in an irrigation district; the maximum amount of water rights which may be held by any such landowner; and the out-of-district transferability of water rights. Transfers can be seasonal or permanent, with water 'attaching' to the land of the transferee in the latter case. 'Attachment' of water rights to the land implies that the former cannot be transferred separately from the latter, and restrains speculation.

In *Mexico,* the new Federal Water Act allows the transfer of water rights, subject to prior government approval if the proposed transfer affects the rights of third parties, or affects the hydrology or ecology of the basin (or aquifer, in the case of groundwater). Water markets are also allowed to develop within a basin or aquifer on the basis of regional, basin-wide, state-wide or local stipulations made by the government. Under the new Act, however, groundwater cannot be transferred separately from the land.

In *Chile,* water rights which have accrued under the existing legislation and those which will be granted under the new legislation will remain freely transferable to different uses and places of use through market transactions. However, all transactions involving water

BOX 16: NATIONAL WATER SECTOR POLICY REVIEW IN TURKEY

The water sector review included the following steps:

Justification for the review

- Provision of sustainable and environmentally sound water resources development.
- Growing regional imbalance between water demand and availability (supply-demand imbalance).
- Changed water uses no longer matched both urban and rural distributional availability.
- Unreasonably high investment in the water sector.

Initiatives

- Preparation of an irrigation master plan and strategy review.

Draft policy document and public consultation

- Several laws and regulations drafted on private sector participation and environmental protection.
- Proposal to parliament for a legislative change to accelerate transfer of responsibility for O&M of irrigation systems to the users.
- Workshops for transfer programme.
- Annual review based on master plan.

Main thrust of policy review and reform

- Institution and capacity building for environmental protection.
- Raise water use efficiency and improve quality of water services through enhanced role of water user organizations, privatization and re-orientation of cost recovery.
- Support to regional development projects, such as the Southeast Anatolia Project (GAP) and the Central Anatolia Project (KOP).

Legislation

- Environmental Protection Law enacted by parliament in 1983.
- Law allowing private sector to build and operate (BOT) hydropower plants enacted in 1984, and amended and expanded in 1994 to cover water supply sector.
- Amended legislation concerning late payment penalty to be imposed on water fees and facilitating transfer of O&M equipment and machinery to private users along with the system.

abstraction works will require prior government authorization. Furthermore, in the arid north of the country, transferability will be effectively impeded in so far as water rights are made to terminate automatically when the use for which they have been granted ends.

Planning and management reforms

Responsibilities in the water sector in *France* were consolidated in the comprehensive legislation passed in 1992. The basin system, which dates back to the 1960s, balances central responsibility with regional and local decision making and control. The country is divided into six river basins, and coordination in each is provided by the Basin Committee. The latter is, in effect, a regional water parliament, in which users confer and resolve their different needs (Box 17). The main features of the 1992 legislation were to empower local communities, and to enhance the powers of the *Agences financières de bassins* - now *Agences de l'eau*.

BOX 17: A NEW WATER LAW IN FRANCE

Water rights in France have recently undergone a thorough renovation. The law of 3 January 1992 considers water as a common heritage and thus closely associates the users of the country's six hydrological basins in its management. It is based on an integrated approach with a dual objective: user satisfaction and conservation of the natural environment.

The Ministry of the Environment masterminds water policy, lays down regulations and organizes overall planning in consultation with, and assisted by, the Inter-Ministerial Water Council. Specific aspects of water management are entrusted to technical ministries. The *prefets*, aided by territorial public services, are responsible for local policing of water and fishing. They authorize uses and discharges, apply legislation specific to pollution or dangerous installation, ensure conformity to quality objectives and approve planning documents (water and fishing).

An original organization

The Law encourages consultation among all water-use partners, whose needs are often contradictory, by means of a planning system that designates legitimate water use: the Water Development Scheme *(Schéma d'aménagement et de gestion des eaux (SAGE))*.

This planning tool is prepared at the local level by the local Basin Committee, and covers a catchment area or river. The local authorities may provide financial aid for planned developments.

Overall coordination at the level of a major hydrographic basin is ensured by the Main Water Development and Management Scheme *(Schéma directeur d'aménagement et de gestion des eaux (SDAGE))*, as drawn up by the Basin Committee and approved by the national authorities.

The Basin Committee is a *de facto* 'Regional Water Parliament'. It organizes meetings among representatives of users, associations and local authorities, who form the majority, as well as State representatives. It fosters consultation and solidarity. It defines the policy and management of the catchment area. It pronounces on the fixing of charges and on the intervention programme tabled by its executive, the Water Agency.

At national level, the National Water Board brings together representatives of different user categories, catchment area structures and public services, and gives its opinion on national water management policy.

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Appendix 1

Indonesia's draft National Resources Policy Action Plan 1994-2020

DRAFT NATIONAL RESOURCES POLICY ACTION PLAN (INDONESIA, 1994-2020)

POLICY	WATER RESOURCES MANAGEMENT	SOCIO-ECONOMICS & FINANCE	ENVIRONMENTAL MANAGEMENT	LEGISLATION & ADMINISTRATION
		I. WATER UTILIZATION		
1. TO PROVIDE ALLOCATION AND UTILIZATION CONDUCIVE TO ECONOMIC AND SOCIAL DEVELOPMENT AND ENVIRONMENTAL SUSTAINABILITY	Objective To make efficient and equitable allocation and utilization of surface and groundwater among sectors considering long-term impacts 1 To base water allocation on water balance in River Basin Plans 2 To administer, implement and enforce an integrated national licensing mechanism of surface and groundwater abstraction and use based on River Basin Plans 3 To review and assess options for and develop allocation mechanisms for inter River Basin transfers and water exports	Objective. To link the water sector with and respond to demographic shifts and changes in the social and economic sectors 1. To use cross-sectoral analysis, planning and development to evaluate and implement present water utilisations and in particular - compile River Basin baseline descriptions on linkages between water utilization and interactions between the water sub-sectors and (a) macro- (fiscal, monetary and trade) and economic policy instruments and (b) inter-sectorial, intrasectoral, distributional and environmental impacts - identify and address related trade-offs and ways of accommodating them in and between the River Basins 2 To identify and formulate the role of water security within the context of national economic security 3. To assess and optimise influence of water policy (a) between economic sectors (b) between national and regional levels and (c) among households and firms 4. To identify options for water policy as rational strategy for economic and regional development 5 To adopt water resources management policy to fiscal austerity, reduced producer subsidy and reduced public share of public water resources investment and other structural adjustment measures as and capital instruments for effective utilization	Objective To adapt water allocation to eco-system management approach. 1. To establish water resources accounting systems for sustainable utilization at national and River Basin levels. 2 To identify and study the linkages between water utilization, public health and environmental protection 3 To design and implement programmes for the enhancement of public awareness of water availability and utilization economy, and related rights and responsibilities	1. Issue and enforce Guidelines for implementation of water licencing regulations. 2 To issue a joint decree of the Ministers respectively responsible for water resources and for mining and energy delegating to the Minister responsible for water resources the allocation of surface and groundwater through a unified licensing mechanism. 3 To sub-delegate responsibility for combined water abstraction and wastewater discharge licensing to PERUMs

POLICY	WATER RESOURCES MANAGEMENT	SOCIO-ECONOMICS & FINANCE	ENVIRONMENTAL MANAGEMENT	LEGISLATION & ADMINISTRATION
2. TO IMPROVE THE EFFECTIVENESS AND EFFICIENCY IN THE UTILIZATION OF WATER.	Objective To reconcile efficiency and equity 1. To institute a system of water service contributions from the users to improve water use efficiency 2. To encourage conjunctive use of surface and ground water through licencing system and water service pricing 3. To classify water resources for optimal utilization based on availability, quality, amenity and other values 4. To establish a system of bulk allocations of surface water by efficiency considerations through consolidated licenses	1. Improve technical efficiency by introduction of appropriate technology for reduction, re-use and recycling 2. Improve economic efficiency by developing (a) reduced water production costs (b) higher production per unit of water (c) cross-subsidies within the River Basin (d) cross-subsidies between River Basins 3. Establish and enforce use-based water service charges to achieve allocative and cost-recovery objectives for water management in the River Basin. Water service charges will be based on actual long-term marginal water costs	1. Identify and address environmental trade-offs of efficient water utilization 2. To respond to requirements for effective integrated natural, human and man-made resources management in the River Basin Plan 3. To design and implement programmes for the evaluation and management of long-term cumulative impacts of water resources development 4. To establish independent screening procedures for EIA 5. To ensure proper timing of EIA in the project cycle 6. To ensure informed and alert end-consumers of product-related effects on water through environmental labelling	1. To incorporate in existing water licencing regulations provisions to the effect that water saved through efficient use of license holder's entitlement is for Government to dispose of under River Basin Plans 2 To include in the Guidelines for the implementation of water abstraction licensing regulations: a. provisions for water and water resources use-based service charges b. provisions for the routine inclusion in water abstraction licences of clauses for technical and economic efficiency of water use. 3. Limited to Provinces which have not yet done so, draft Provincial Government Regulations for the implementation of the wastewater charging provisions of Government Regulation 20/1990 on water pollution control 4. To review legislation on EIA and incorporate independent screening procedures and ensure proper timing of EIA in the project cycle

POLICY	WATER RESOURCES MANAGEMENT	SOCIO-ECONOMICS & FINANCE	ENVIRONMENTAL MANAGEMENT	LEGISLATION & ADMINISTRATION
		II. WATER QUALITY		
3 TO PROVIDE LEVELS OF QUALITY IN INDONESIA'S WATER RESOURCES WHICH ARE CONDUCIVE TO ECONOMIC AND SOCIAL DEVELOPMENT AND ENVIRONMENTAL SUSTAINABILITY	1 To administer and enforce a combined national licensing system for water abstraction and waste water discharge based on River Basin Plans 2 To establish priorities for water quality control based on population density 3 To strengthen national and regional capacity for R&D in water quality management by - improving water quality information - developing appropriate technology for wastewater treatment - identifying needs, activities and resource requirements for water pollution control - coordinating with urban and rural sanitation strategies 4. To identify and declare water resources protection areas 5 To control sedimentation through adequate watershed management	1 To establish mechanisms for cross-sectorial policy analysis, planning and development 2 To review policies on agricultural inputs and their effect on water quality 3. To establish and enforce water service effluent charges for efficient water management and recovery of water pollution control service costs within the River Basin 4. Establish and enforce a water resources conservation charge on land uses in the catchment with an impact on water quality 5. To review and assess the effectiveness and efficiency of the current and proposed water quality standards for water resources management	1 To inventory and assess flora and fauna threatened by water pollution and ensure their protection 2. To design and implement programmes for water quality management in coordination with existing and on-going activities 3. To review economic and policy measures to increase compliance with pollution control measures	1. To institute and enforce a combined licensing system for water abstraction and wastewater disposal based on River Basin Plans by mutually reconciling Min PW Decree 45/1990 on water pollution, Min PW Decree 49/1990 on water abstraction licencing, Government Regulation 22/1982 on Water Resources Management and Government Regulation 20/1990 on Water Pollution Control 2. To include in the standard forest logging concession agreement payment of a water resources conservation charge on land uses in the catchments with an impact on water resources. 3 To draft legislation restricting social and economic activities in and around water bodies, catchment and recharge areas, consistent with Spatial Land-use Plans, to protect water sources

POLICY	WATER RESOURCES MANAGEMENT	SOCIO-ECONOMICS & FINANCE	ENVIRONMENTAL MANAGEMENT	LEGISLATION & ADMINISTRATION
III. WATER RESOURCES DEVELOPMENT				
4 TO DEVELOP WATER RESOURCES UNDER THE NATIONAL WATER RESOURCES DEVELOPMENT PLAN (NWRDP) BASED ON RIVER BASIN PLANNING.	Objective. To move to a planned programme approach for water resources development 1. To develop and establish a participatory, interactive and consensus seeking process for River Basin Planning for national and provincial River Basins 2. To integrate river basin planning processes and instruments with spatial planning processes and instruments. 3. To identify priorities for the formulation of River Basin Planning based on (a) water balance (b) water pollution (c) River Basins as Special Development Areas 4. To complement existing flood control programmes with zoning of floodplains and disaster preparedness in coordination with Spatial Land-use Plans 5. To create capacity for River Basin Planning; secure collection and processing of data for River Basin Planning	1. To establish a River Basin Planning process interactive with mainstream planning for preparation of NWRDP 2 To prepare regional development strategies based on River Basin Planning in regions with water scarcity and in particular regions with (a) critical water availability and/or subject to flooding (b) upstream - downstream interdependence for water availability and/or flood divided by administrative boundaries 3 To give recognition to and reflect changes in macroeconomic policies in development of River Basin Planning 4 To address and accommodate trade-offs between development objectives in the development of River Basin Planning 5 To establish the interactions between water producers and users in the River Basin Plan 6 To introduce efficient flood plain management under River Basin Plans	1. To establish and implement a participatory and interactive process for EIA of River Basin Plans and of Spatial Plans 2. To protect aquatic habitats including lakes, wetlands and coastal waters through regulation, incentives and in River Basin Plans 3. To design and implement conservation programmes with increased public participation 4. To manage soil conservation and water-shed management in the formation of River Basin Plans 5. To reflect and give recognition to traditional and cultural values in the formation of River Basin Plans.	1 To draft and implement legislation regulating River Basin Planning consistent with Spatial Land-use Planning 2. To incorporate in existing EIA regulations and implementing mechanisms a requirement for EIA of River Basin Plans and Spatial Plans 3. To enact and implement legislation water resources related disaster preparedness 4. To investigate water related customary law and practices and assess their relevance and impact on River Basin Planning

POLICY	WATER RESOURCES MANAGEMENT	SOCIO-ECONOMICS & FINANCE	ENVIRONMENTAL MANAGEMENT	LEGISLATION & ADMINISTRATION
5. TO ENHANCE PRIVATE SECTOR AND COMMUNITY PARTICIPATION IN FINANCING OF WATER RESOURCES DEVELOPMENT	1. To establish, under the control of the Government : (a) New River Basin branches of PERUM Jasa Tirta, and Provincial State Companies (PERUMDA), as organizations for water resources development (b) Formal Water Users' Groups 2. To identify and prepare viable programmes for private participation in water resources development through joint ventures with the Government 3. To establish schemes to encourage controlled self-development of surface and groundwater	1. To identify viable financial schemes and instruments to attract financial resources from private interests and the public,in accordance with deregulation policy and, in particular, - review, under River Basin Planning, the potential for acquisition of private financial resources for water resources management and development 2. To review water service charges for compatibility with private sector participation	1. Delegate financial responsibilities and benefits to the immediate beneficiaries	1. To draft legislation to give User's groups legal status before the law and to enable them to function in a corporate capacity 2. To draft legislation to enforce the beneficiaries' responsibility for O&M of main water works 3. To draft legislation enabling and motivating the public, including financing institutions to participate in financing water resources management and development and establishing relevant procedures and requirements
6. TO ESTABLISH A SUSTAINABLE BUDGET SYSTEM FOR WATER RESOURCES MANAGEMENT.	1. To establish independent annual and multi-annual capital budget components, based on River Basin Plans for Water Resources: (a) Water management administration (b) Water Resources Planning (c) River Improvement	1. To make balanced appropriation of budgetary resources between management including improved services to the public, development and O&M 2. To institute a system of water abstraction and wastewater discharge contributions. 3. To secure specific Government budgetary appropriations for water resources enhancement for all purposes.	1. To secure budgetary resources for water conservation and environmental protection measures 2. To provide budget for environmental management and monitoring plans at the River Basin level, out of project funds	1. To adjust legislation on national budget structure so as to accommodate a sustainable budget for water resources management

POLICY	WATER RESOURCES MANAGEMENT	SOCIO-ECONOMICS & FINANCE	ENVIRONMENTAL MANAGEMENT	LEGISLATION & ADMINISTRATION
IV. WATER RESOURCES MANAGEMENT STRUCTURE				
7. CREATE A WATER RESOURCES MANAGEMENT STRUCTURE CONSISTENT WITH INTEGRATED MANAGEMENT OBJECTIVES	1. To coordinate water resources management activities. 2. To establish a structure and capacity for water policy development and for monitoring of water resources planning, management and development. 3. To establish central government water resources management capacity including River Basin Planning and allocation for water abstractions, waste water discharges and other water uses of surface and ground water resources (National River Basins) making use of existing structure and manpower. 4. To entrust operational water management functions at basin level in National River Basins to branches of Perum Jasa Tirta in (a) River Basins or groups of basins that are financially viable; (b) non-viable basins or groups of basins to be supported by inter-basin cross-subsidies. 5. As an intermediate arrangement in river basins that are not financially viable, to entrust operational water mana- gement with non-structural Technical Units (UPTs) 6. At the Provincial level, to structure Technical Units (UPTs) along River basin lines for River Basin Planning and the integrated quantity and quality management of surface and ground water resources of Provincial River Basins	1. Subsidize the implementation of River Basin Plans as required 2. To identify and confirm the financial viability of river basin management areas based on economy to support and populations served by water resources management	1. To develop institutional to integrate water resources management within the frame of natural resources management	1. To consider : (a) structuring the National Water Resources Council as a Committee of Ministers at policy making level, and a Technical Committee of Directors-General; (b) coordinating the Council with the National Spatial Planning Committee through the Council chairman becoming an ex officio member of the said National Committee.

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